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YOUNG HEREFORD BULLS.

"Albert Victor," "Jupiter," "Tramp," "Trumpeter," "Wilton Grange."



*Queensland
Agricultural Journal*





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15

| C. | | | |
|--|-----|------|-----|
| California Harvester | ... | ... | 336 |
| California Redwood | ... | ... | 300 |
| Canaille, Notes on | ... | ... | 415 |
| Canadian Forests | ... | ... | 301 |
| Cane Grubs | ... | ... | 133 |
| Cane Juice, Honey from | ... | ... | 92 |
| Canning Strawberries | ... | ... | 424 |
| Canning Tomatoes | ... | ... | 425 |
| Cardamoms | ... | ... | 414 |
| Cattle Dips | ... | ... | 512 |
| Cattle, Malignant (Edema in | ... | ... | 505 |
| Cattle, to Tell the Age of | ... | ... | 551 |
| Cattle, Tuberculosis in | ... | ... | 71 |
| Cattle, Weight of | ... | ... | 321 |
| Causes of Decay in Plants, and the Remedy to give them New Life | ... | ... | 489 |
| Cereal Breeding | ... | ... | 164 |
| Chairman's Address | ... | ... | 107 |
| Champagne, Australian | ... | ... | 508 |
| Changes in Milk | ... | ... | 27 |
| Charlock, Eradication of | ... | 253, | 336 |
| Cheap Cattle Dip, Plan of | ... | ... | 315 |
| Cheap Money for Farmers | ... | ... | 146 |
| Checking Swarming | ... | ... | 406 |
| Chemistry of Engineering Materials— Wood | ... | ... | 594 |
| Chickasaw Plum | ... | ... | 563 |

| | Page. |
|---|--------------|
| Classification of Poultry | 282 |
| Cocky Chaff | 91 |
| Coffee | 129 |
| Coffee, Compressed | 319 |
| Coffee Culture in Queensland | 584 |
| Coffee Leaf Disease and Seed Importations | 408 |
| Coffee Plant, Tenacity of Life of | 410 |
| Coffee Seed, Germinating | 426 |
| Coffee, the Future of | 407 |
| Coffee, the World's Trade in | 406 |
| College Herd | 26, 226, 549 |
| College, Queensland Agricultural | 349, 474 |
| Comparative Cost of Wheat-growing in Argentina and Queensland | 256 |
| Considerations on the Wines Exhibited at the Brisbane Exhibition, 1899 | 285 |
| Contributions to the Flora of New Guinea | 41 |
| Contributions to the Flora of Queensland | 37, 387, 483 |
| Corn Cobs as a Food | 439 |
| Corn Marker, a Useful | 322 |
| Corn, Utilising the American Crop | 530 |
| Cotton, Manuring of | 295 |
| Cream Cheese | 536 |
| Crossing Onions | 530 |
| Cuba, Sugar Plantations in | 90 |
| Cultivation of Broom Corn | 1, 233, 337 |
| Cultural Notes for Tropical Queensland | 430 |
| Cure for Greasy Heels | 477 |
| Cure for Warts | 320 |
| Curing Cow Pea Hay | 343 |
| Curing Ham and Bacon, Pickle for | 99 |
| Cutlets, Vegetable | 98 |
| Cuts on Horses, Remedy for | 276 |

D.

| | |
|---|------------------------|
| Dairy Herd—Queensland Agricultural College | 474, 533, 549 |
| Dairying | 12, 262, 362, 469, 536 |
| Dairying Legislation, Proposed | 188 |
| Dairymen, Hints for | 313 |
| Dakota Millet | 465 |
| Dakota (U.S.A.), Wheat-growing in | 260 |
| Date Palms, Lake Harry | 590 |
| Depth for Sowing Seeds | 92 |
| Description of Some Vines Growing at the State Farms | 36, 284 |
| Destroying Prickly Pear | 421 |
| Destruction of Ants | 509 |
| Destruction of Charlock | 336 |
| Development of the Pig Industry | 186 |
| Dips, Cattle | 512 |
| Divining Rod | 304, 510 |
| Drainage | 179 |
| Drenching Bit | 316 |
| Duck Farm, a Large | 562 |
| Ducks | 30 |
| Ducks, Indian Runner | 365, 562 |

E.

| | |
|--|-----|
| Early Potatoes, to Raise | 90 |
| Early Strawberries | 35 |
| Earth or Pea Nut | 7 |
| Easy Mode of Hardening Ploughshare Points | 100 |
| Economic Uses and Nutritious Value of Maize | 239 |
| Effects of the Late Frost on Vines | 576 |
| Eggs, Flavour in | 32 |
| Eggs, Preservation of | 560 |
| Eggs, Preserving | 318 |
| Eggs, the Lime-water Preservative for | 427 |
| Eggs, the Preservation of | 366 |
| Eggs, Record Shipment of | 601 |

| | |
|---|-----|
| English Wheat Crop | 600 |
| Enoggera Sales 101, 227, 327, 428, 515, 602 | 602 |
| Eradication of Charlock | 253 |
| Estimating Acidity of Milk | 264 |
| Exhibits at the Pastoral and Agricultural Society's Show at Bowen (N.Q.) | 440 |
| Experimental Plots | 243 |
| Experiments in Manuring | 529 |
| Export and Import of Wheat (New South Wales) | 325 |

F.

| | |
|--|--------------|
| Factories, Butter and Cheese, in Queensland | IV. |
| Farm Chemistry—The Use of Kainit | 245 |
| Farmer, the State in its Relation to the | 154 |
| Farmers and the Frost | 431 |
| Farmers, Useful Information for | 100 |
| Farming and Industrial Associations | 189 |
| Farm Notes 103, 229, 329, 430, 517, 603 | 603 |
| Farm, to Reduce Alkali Spots on | 440 |
| Feather Eating | 282 |
| Feeding Sugar to Horses | 277 |
| Felling Timber during the Waning Moon | 99, 300 |
| First Steps in Bee-Keeping | 294 |
| Fixing Foundations into Frames | 291 |
| Flavour in Eggs | 32 |
| Flies, Remedy for | 422 |
| Flies, to Clear Away | 600 |
| Flora of New Guinea, Contributions to the | 41 |
| Flora of Queensland, Contributions to the | 37, 386, 483 |
| Folding Sawing Machine | 509 |
| Food Value of Guinea-grass | 302 |
| Forest Conservancy | 493 |
| Forest Denudation | 301 |
| Forestry in Ireland | 301 |
| Forestry in Japan | 502 |
| Forestry in Western Australia | 92 |
| Forests of Siberia | 503 |
| Fowls for Exhibition | 366 |
| Fowls in Confinement | 31 |
| Fowl, Points of a | 481 |
| Fowls, Washing, for Exhibition | 559 |
| Frost Protection | 529 |
| Fruit Culture in Queensland—Manuring | 375, 565 |
| Fruit Fly | 480 |
| Fruit Propagation Extraordinary | 422 |
| Fruit, South African | 33 |
| Fruit Tree Pruning at Westbrook Experiment Farm | 283 |

G.

| | |
|---|-----|
| Garden Notes 103, 229, 329, 430, 517 | 517 |
| Garden Paths, Weeds on | 511 |
| Geese, Shoeing | 422 |
| Gladiolus | 578 |
| Green Manuring | 117 |
| Grow your Own Tobacco | 600 |
| Grubs, Cane | 133 |
| Guinea-grass, Analysis of | 588 |
| Guinea-grass, Food Value of | 302 |

H.

| | |
|--|-----|
| Hackneys | 477 |
| Hams or Bacon, Pickle for Curing | 99 |
| Handling Heavy Pipe Tobaccos | 299 |
| Handling Wheat | 420 |
| Hay, Shipping | 467 |
| Height to which a Colt will Grow, to Estimate | 322 |

GENERAL INDEX.

v.

| | Page. |
|---|-------|
| Hemp, Sisal, at Mackay | 420 |
| Herberton District, Report on the Timber Trees of | 391 |
| Hereford Stud Farm, a Typical | 247 |
| Hints for Dairymen | 313 |
| Hints for Horseowners | 276 |
| Historians, Trees as | 504 |
| History of the Angora Goat | 526 |
| Honey and Beeswax in Victoria | 577 |
| Honey from Cane-juice | 92 |
| Honey, Varieties of | 290 |
| Honey Vinegar | 322 |
| Hop-growing in Victoria | 508 |
| Horses, Feeding Sugar to | 277 |
| Horses, Working Without Shoes | 277 |
| Horse, to Stop a Runaway | 319 |
| Horticultural and Agricultural Shows | 100 |
| Horticultural Notes 48, 230, 288, 330, 517, 605 | 561 |
| How Chicks Grow | 599 |
| How Long Plants will Live | 509 |
| How to Extract a Splinter | 321 |
| How to Keep Butter Hard without Ice | 598 |
| How to Make a Safety Light | 362 |
| How to Pasteurise Milk | 212 |
| How Will the Agricultural Interest of Southern Queensland be Affected by the Adoption by this Colony of the Commonwealth Bill | |

I.

| | |
|---|----------|
| Indian Runner Ducks | 365, 562 |
| Indian Sugar and Countervailing Duties | 310 |
| Inoculation as a Preventive of Tick Fever | 86 |
| Irrigation by Artesian Water | 459 |

J.

| | |
|--------------------------|-----|
| Jadoo Fibre | 598 |
| Japan, Forestry in | 502 |
| Judging Potatoes | 423 |

K.

| | |
|--|-----|
| Kainit Injurious to Strawberries | 565 |
| Kainit, the Use of | 245 |
| Keeping a Meal Hot | 98 |
| Keeping Lard | 600 |
| Kei Apple Seed | 325 |

L.

| | |
|--|-----|
| Labour Problem in Connection with the Sugar Industry | 116 |
| Lake Harry Date Palms | 590 |
| Lamb Troubles | 262 |
| Large Duck Farm | 562 |
| Large Trees | 513 |
| Late Exhibition as a Factor in Education | 261 |
| Leading a Vicious Bull | 315 |
| Lime-water Preservative for Eggs | 427 |
| Link Belt Cane Unloader | 441 |
| Liquid Manure | 601 |
| List of Agricultural, Horticultural, and Pastoral Associations of Queensland | I. |
| List of Butter and Cheese Factories in Queensland | IV. |
| Live Stock in the United States | 93 |
| London Markets | 325 |

M.

| | |
|-------------------------|----------|
| Macaroni Wheats | 242, 421 |
| Maize in Victoria | 425 |
| Maize, Price of | 514 |

| | Page. |
|--|--------------|
| Male Coffee Plants | 582 |
| Malignant (Edema in Cattle | 505 |
| Malting Barley and Butter | 514 |
| Management of Agricultural Shows | 97 |
| Manure for Roses | 317 |
| Manure, Stable | 513 |
| Manurial Experiments | 529 |
| Manuring Fruit Trees | 375, 565 |
| Manuring, Green | 117 |
| Manuring of Tropical Plants, Cotton | 295 |
| Market Gardening | 10, 236, 354 |
| Markets 101, 227, 327, 428, 515, 602 | |
| Marsupial Conference, Proceedings of | 534 |
| Millet, Dakota | 464 |
| Minister for the Bureau of Animal Industry | 205 |
| Mint, Transplanting | 324 |
| Molasses, the Use of, as a Food for Live Stock | 348 |
| Mushrooms | 234 |
| Mutton Hams, Pickle for | 601 |

N.

| | |
|---|----------|
| New Food for Stock | 317 |
| New Guinea Rubber | 584 |
| Newspaper, Spruce Fir Pulp for | 590 |
| New Textile Plant | 599 |
| Notes on Olive Cultivation | 575 |
| Notes on Rockhampton and the Central District | 433 |
| Novel and Cheap Rabbit Trap | 314 |
| Nut-grass | 169, 460 |
| Nutritive Value and Economic Uses of Maize | 239 |

O.

| | |
|--|-----|
| Observations on Ticks and Tick Fever at the Indooroopilly Experiment Station and at St. Helena | 81 |
| Œdema, Malignant, in Cattle | 505 |
| Old Orange-tree | 514 |
| Olive Cultivation | 368 |
| Olive Truncheons, Planting | 575 |
| Onions, Crossing | 530 |
| Orchard Notes 102, 228, 328, 429, 516, 603 | |
| Our Botanic Gardens | 42 |
| Our Farming and Industrial Associations | 139 |

P.

| | |
|--|-----|
| <i>Panicum colonum</i> | 92 |
| Pansies | 48 |
| Peaberries and the Male Coffee Plant | 582 |
| Pea or Earth Nut | 7 |
| Philippines, Sugar in the | 97 |
| Pickle for Curing Hams or Bacon | 99 |
| Pickle for Curing Mutton Hams | 601 |
| Pig Industry, the Development of | 186 |
| Pig, the First, in Scotland | 91 |
| Pigs and their Management | 537 |
| Plan and Specification of a Cheap Cattle Dip | 315 |
| Planting Olive Truncheons | 575 |
| Plant Pathology | 57 |
| Plants reputed Poisonous to Stock 41, 287 | |
| Ploughing Matches and Agricultural Societies | 362 |
| Plum, the Chickasaw | 563 |
| Plymouth Rocks | 281 |
| Points of a Fowl | 481 |
| Popular Botany | 42 |
| Portable Poultry-house | 562 |
| Possibilities and Difficulties of Tropical Agriculture in Queensland | 124 |
| Potato Disease | 57 |

| | Page. |
|---|---------|
| Potato Planter | 246 |
| Potatoes, Judging | 423 |
| Potatoes, Sweet | 513 |
| Potatoes, the Best Manure for | 90 |
| Potatoes, to Raise Early | 90 |
| Poultry, Classification of | 282 |
| Poultry for a Small Garden | 278 |
| Poultry Notes | 32, 560 |
| Poultry Shipments | 93 |
| Preparing Honey for Market | 291 |
| Preserving Eggs | 318 |
| Preservation of Eggs | 560 |
| Preserve the Forests | 93 |
| Prevention of Weevil | 427 |
| Price of Maize | 514 |
| Prickly Pear, Destroying | 421 |
| Principles of Sheepbreeding 15, 270, 356, | 443 |
| Probable Preventive to Rust in Wheat | 162 |
| Produce, a Market for Queensland | 314 |
| Proposed Dairy Legislation | 188 |
| Protection of Rubber Trees in Africa | 98 |
| Pumpkins, the Value of | 355 |
| Public Announcements | I. |
| Putting up Honey | 577 |

Q.

| | |
|---|-------------------|
| Queensland Agricultural College | 349, 533 |
| Queensland Agricultural College Dairy Herd | 26, 226, 474, 549 |
| Queensland, Fruit Culture in | 375, 565 |
| Queensland Indigenous Species of Vitis as a Stock for the Grape Vine | 482 |
| Queensland, List of Butter and Cheese Factories in | IV. |
| Queensland, some Timber-trees of | 417, 499, 591 |
| Queensland Rice | 587 |

R.

| | |
|---|------|
| Rabbit Trap, a Novel | 314 |
| Record Shipment of Eggs | 601 |
| Reducing Bones | 525 |
| Regulations under the Stock Act | XIV. |
| Relative Value of the different Foods for Stock | 600 |
| Remedy for Cuts on Horses | 276 |
| Remedy for Flies | 422 |
| Report on the Timber Trees of the Herberton District | 391 |
| Resolutions and Reports | 220 |
| Rice, Queensland | 587 |
| Rice in Broom Millet | 322 |
| Ringbarking and Rainfall | 419 |
| Rockhampton and Central Districts, Notes on | 433 |
| Roses, a Good Manure for | 317 |
| Rubber-extracting Machine | 424 |
| Rubber in British New Guinea | 323 |
| Rubber Industry | 410 |
| Rubber Market, the Belgian | 324 |
| Rubber, New Guinea | 581 |
| Rubber Trees in Africa, Protection of | 98 |
| Runaway Horse, to Stop | 319 |
| Russian Wolf Trap | 320 |
| Rust in Wheat | 162 |

8.

| | | | | |
|-----------------------------------|-----|------|------|-----|
| Sawing Machine | ... | ... | ... | 509 |
| Seed Sowing Extraordinary | .. | ... | ... | 321 |
| Seed Wheat | ... | ... | ... | 511 |
| Sheep, Black Merino | ... | ... | ... | 247 |
| Sheep-breeding in Argentina | ... | ... | ... | 267 |
| Sheep-breeding, The Principles of | 15, | 270, | 356, | 443 |

| | |
|--|--------------------|
| | Page. |
| Sheep Dressing | 312 |
| Sheep of the World | 532 |
| Shipping Hay | 467 |
| Shoeing Geese | 422 |
| Should Eggs be Washed ? | 559 |
| Shows, Agricultural and Horticultural | 100, |
| | 326, 514 |
| Shows, the Value of | 238 |
| Siberia, the Forests of | 503 |
| Sisal Hemp at Mackay | 420 |
| Skins, Another Method of Tanning | 99 |
| Skim Milk as Food for Growing Chickens | 556 |
| Slugs, Vaginula | 63 |
| Small Farm—What can be Done on it | 333 |
| Some Considerations on the Wines exhibited at the Brisbane Exhibition of 1899 | 285 |
| Some Timber Trees of Queensland | 417, 499, |
| | 591 |
| South African Fruit | 33 |
| South Australia, Wheat-growing in | 452 |
| Sowing Seeds, Depth for | 92 |
| Spayed Cows, Tuberculosis in | 71 |
| Specification and Plan of Cheap Cattle Dip | 315 |
| Splinter, How to Extract | 509 |
| Spruce Pulp for Newspaper | 590 |
| Stable Manure | 513 |
| Stable Notes | 28, 275, 363, 475, |
| | 553 |
| Stack, Building | 526 |
| State Farms Exhibits at Bowen Park | 343 |
| Stock Act, Regulations Under | xiv. |
| Strawberries, Canning | 424 |
| Strawberries, Early | 35 |
| Strawberries, Kaimit Injurious to | 565 |
| Strawberries, Yield of | 323 |
| Sub-Drainage | 182 |
| Sugar Cane, from Seed | 491 |
| Sugar Industry, and its Requirements | 110 |
| Sugar Industry in the North | 49 |
| Sugar Industry in the Philippines | 93, 98 |
| Sugar Plantations in Cuba | 90 |
| Sulphate of Copper | 510, 441 |
| Summer Pruning | 385 |
| Sun Flowers | 352 |
| Sweet Potatoes | 513 |

T.

| | |
|---|--------------|
| Tanning Skins, Another Method of | 99 |
| Tap Root, Water at | 97 |
| Tasmanian Beech | 590 |
| Teats, Warts on | 511 |
| Telegony | 555 |
| Temperature of Tree Timbers | 505 |
| Tenacity of Life of the Coffee Plant | 410 |
| The Advantage of Separated | over |
| Skimmed Milk for rearing Calves | 193 |
| The American Wheat Crop | 99 |
| The Ayrshire Cow | 546 |
| The Belgian Rubber Market | 324 |
| The Best Manure for Potatoes | 90 |
| The Brazilian Coffee Crop | 587 |
| The Cause of Decay in Plants, and the | |
| Remedy | 489 |
| The Chairman's Address | 107 |
| The Chemistry of Material for Engi- | |
| neering—Wood | 594 |
| The Chickasaw Plum | 563 |
| The Cultivation of Citrus Fruits | 171 |
| The Dairy Herd, Queensland Agricultural | |
| College | 26, 474, 549 |
| The Development of the Pig Industry | 186 |
| The Divining Rod | 304, 510 |
| The Drenching Bit | 316 |
| The Effects of the Late Frost on Vines | 576 |
| The First Pig in Scotland | 91 |
| The Forests of Siberia | 503 |
| The Future of Coffee | 407 |

| | Page. |
|---|-------------------|
| The <i>Cladiolus</i> | 578 |
| The Hackney | 477 |
| The Link Belt Cane Unloader | 441 |
| The Markets ... 101, 227, 327, 428, 515, | 602 |
| The Nurse Root System | 511 |
| The Philippine Sugar Industry | 93 |
| The Possibilities and Difficulties of Tropical Agriculture in Queensland | 124 |
| The Preservation of Eggs | 366 |
| The Principles of Sheep-breeding | 15, 270, 350, 443 |
| The Rubber Industry | 410 |
| The Russian Wolf Trap | 310 |
| The Sheep of the World | 532 |
| The State in its Relation to the Farmer | 154 |
| The St. Helena Herd | 469 |
| The Sugar Industry in the North | 49 |
| The Value of Poultry | 314 |
| The Wool Industry from a Buyer's Stand-point | 361, 463 |
| The World's Coffee Trade | 406 |
| The World's Wheat Supply | 468 |
| Thunder and Hatching | 369 |
| Tick Fever | 81 |
| Tick Fever, Inoculation as a Preventive of | 80 |
| Timber Felling during the Waning Moon | 99 |
| Timber Felling in the Tropics | 300 |
| Tobacco | 125, 600 |
| Tobaccos, Handling Heavy Pipe | 297 |
| To Clear Away Flies | 600 |
| To Detect Adulteration in Sulphate of Copper | 318 |
| To Estimate the Height to which a Colt will Grow | 322 |
| To Prevent Birds Sitting on Grafts | 423 |
| To Raise Early Potatoes | 90 |
| To Redeem Alkali Spots on a Farm | 440 |
| To Stop a Runaway Horse | 319 |
| To Tell the Age of Cattle | 551 |
| Tomatoes, a good Manure for | 421 |
| Tomatoes, Canning | 425 |
| Tomato Pulp for Export | 424 |
| Transplanting Mint | 324 |
| Trap, a Wallaby | 421 |
| Tree Guards | 95 |
| Tree Planting by Farmers | 591 |
| Trees as Historians | 504 |
| Trip to Mirani | 222 |
| Tropical Plants, Manuring of | 295 |
| Tuberculosis in Cattle | 76, 305 |
| Tuberculosis in Spayed Cows | 70 |
| Turkeys as Sitters | 281 |
| Typical Hereford Stud Farm | 247 |

U.

| | |
|---------------------------------------|-----|
| United States, Live Stock in | 93 |
| Useful Cornmarker | 322 |
| Useful Invention | 322 |
| Useful Information for Farmers | 100 |

| | | | | | |
|---|-----|-----|------------------------|-------|----------|
| Use of Kainit | ... | ... | ... | Page. | 245 |
| Uses of Maize... | ... | ... | ... | ... | 239 |
| Utilising the American Corn Crop | ... | ... | ... | ... | 530 |
| V. | | | | | |
| Vaginula Slugs | ... | ... | ... | ... | 63 |
| Value of Poultry | ... | ... | ... | ... | 315 |
| Value of Pumpkins | ... | ... | ... | ... | 355 |
| Value of Straw | ... | ... | ... | ... | 238 |
| Varieties of Honey | ... | ... | ... | ... | 290 |
| Vegetable Cutlets | ... | ... | ... | ... | 98 |
| Vicious Bull, Leading a | ... | ... | ... | ... | 315 |
| Victoria, Honey and Beeswax in | ... | ... | ... | ... | 577 |
| Victoria, Hop-growing in | ... | ... | ... | ... | 508 |
| Vinegar, Honey | ... | ... | ... | ... | 322 |
| Vines, the Effects of the Late Frosts on | ... | ... | ... | ... | 576 |
| Vineyard Notes | ... | ... | ... | ... | 36, 37 |
| Viticulture | ... | ... | 36, 284, 385, 482, 576 | ... | 576 |
| W. | | | | | |
| Wallaby Trap | ... | ... | ... | ... | 421 |
| Waning Moon, Felling Timber during the | ... | ... | ... | ... | 99 |
| Washing White Fowls for Exhibition | ... | ... | ... | ... | 559 |
| Warts, a Cure for | ... | ... | ... | 320, | 599 |
| Warts on Teats | ... | ... | ... | ... | 511 |
| Water at the Tap Root | ... | ... | ... | ... | 97 |
| Wattle-growing | ... | ... | ... | ... | 502 |
| Weeds on Garden Paths | ... | ... | ... | ... | 511 |
| Weevil, Prevention of | ... | ... | ... | ... | 427 |
| Weight of Cattle | ... | ... | ... | ... | 321 |
| Westbrook Experiment Farm, Fruit Tree Planting at | ... | ... | ... | ... | 283 |
| What Can be Done on a Small Farm | ... | ... | ... | ... | 333 |
| Wheat Crop, the American | ... | ... | ... | ... | 99 |
| Wheat, Exports and Imports, New South Wales | ... | ... | ... | ... | 325 |
| Wheat Farming in Dakota | ... | ... | ... | ... | 260 |
| Wheat Farming in New South Wales | ... | ... | ... | ... | 260 |
| Wheat Farming in South Australia | ... | ... | ... | 260, | 452 |
| Wheat-growing in Argentina and in Queensland, Comparative Cost of | ... | ... | ... | ... | 256 |
| Wheat-growing in the Victorian Mallee | ... | ... | ... | ... | 259 |
| Wheat, Rust in | ... | ... | ... | ... | 162 |
| Wheat Supply, the World's | ... | ... | ... | ... | 468 |
| Wheats, Macaroni | ... | ... | ... | 242, | 421 |
| Wines at the Brisbane Exhibition of 1899, some Considerations on | ... | ... | ... | ... | 285 |
| Wolf Trap, a Russian | ... | ... | ... | ... | 320 |
| Wooden Matches | ... | ... | ... | ... | 601 |
| Wool Industry, from a Buyer's Stand-point | ... | ... | ... | ... | 361, 465 |
| Working Horses without Shoes | ... | ... | ... | ... | 277 |
| World's Coffee Trade | ... | ... | ... | ... | 406 |
| Y. | | | | | |
| Yield of Strawberries | ... | ... | ... | ... | 323 |

Agriculture.

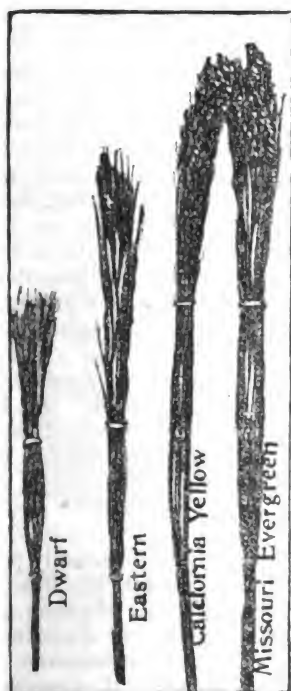
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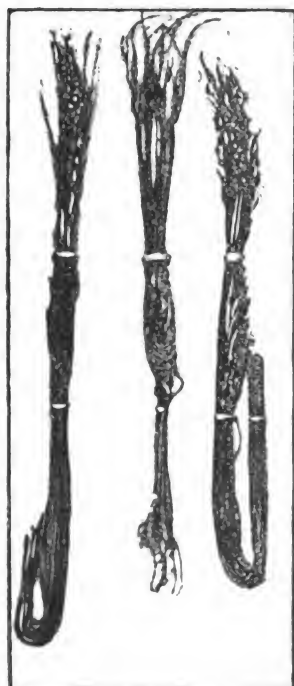
By DANIEL JONES.

PREPARATION OF THE SOIL.

A GOOD commercial fibre can be produced on any fairly good fertile soil. I have grown this crop on red volcanic sandy soil, on light black lands, and on the more tough, waxy sorts of black soil. The prime essential is to have your land in good tilth, the delicate nature of the young shoot rendering it imperative that the soil conditions be such as to facilitate easy germination. In New South Wales the crop is chiefly produced in the Hunter River district, the deep rich alluvial flats contiguous to that stream producing luxuriant crops of fair quality. I have also seen samples of good broom corn at the Department of Agriculture, Sydney, grown in the interior of the colony, the product of irrigation from artesian bores. In our own colony profitable crops can be and are grown on any land that will suit maize or wheat. The land should be ploughed to a depth of about 6 inches, and harrowed to as fine a seed bed as possible. All rubbish should be turned in or burnt off, as this will materially simplify the operations of planting. In the event of sowing with a machine, the presence of such obstacles as clumps of weeds or roots of old crops materially impedes sowing and cleaning operations, and tries the temper of the farmer, as well as proving a hindrance to expeditious and accurate operations. In selecting an area for sowing this crop, some consideration should be paid to



BROOM CORN PROPERLY GROWN.



BROOM CORN IMPROPERLY GROWN.

aspect. Strong winds encountered at ripening time, accompanied by wet weather, are very liable—when the broom-heads are heavy—to blow the crop down. Of course, such a contingency is probable with all crops, but I know of no more difficult and annoying trouble to be handicapped with than to cut broom-heads when they are mixed up in inextricable confusion, the result of a gale of wind accompanied by tropical rains. As this crop is not capable of withstanding much wet either in the soil or atmosphere, soils that are in their nature excessively wet and ill-drained had better be avoided, or, if such conditions unavoidably obtain, care must be observed that the crop shall not materially suffer from such causes. A soil that retains too much wet not only retards development, but at the critical period when the broom-heads are in condition for bending or cutting, if long wet weather supervenes, the moisture militates considerably against getting on the land for the purpose of cutting the crop, and as a consequence the fibre is often either badly discoloured or is in too forward a condition to sell as a good marketable commodity. Given moderately rich soil, not too retentive of moisture, well ploughed, and thoroughly harrowed to a fine state of tilth, and under these conditions no farmer need be apprehensive as to the adaptability of his land to yield—if seasonal conditions are favourable—a satisfactory crop both in quantity and quality.

The time for preparation of the soil will determine itself when deciding for an early or late crop of broom corn. In the Moreton districts, I have sown the seed as early as 22nd July with good results. This very early sowing is only recommended in such localities as may reasonably be expected to be protected from late frosts, for, in the event of these occurring, it would possibly seriously affect the development of the crop, and most probably a severe frost would destroy the tender growth.

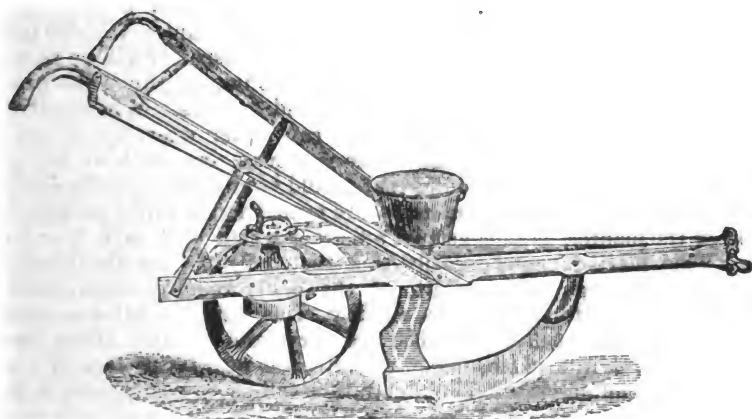
Where the locality is favourable for early sowing, it is judicious for the farmer to avail himself of this advantage, inasmuch as an early planting will have several advantages, chief among which is the harvesting of the crop before our coastal wet season usually sets in. A crop sown during the latter part of July, if the season is favourable, will be fit to cut about the early part of November. The crop, being in thus early, will be much ahead of the New South Wales crops, and, as a consequence of its being the earliest on the market, it will be in better demand. Another advantage accrues from early planting. That is, the possibility of harvesting a second crop, either a ratoon or a fresh sowing. Thus, in order to have your ground in good condition for an early crop, it is expedient to set about the preparation of the land sufficiently early to let the soil become aerated and disintegrated, so as to be in condition for sowing during July for an early crop, and as far on in the season as December for a late one. It must be borne in mind that broom corn matures better and revels in a good warm season. Under such conditions its growth is most vigorous, and the yield is heavier. Hence late sowing is more likely to prove less satisfactory than the early or medium period. I would here once again like to specially emphasise in time the need of as fine a seed bed as possible to facilitate the mechanical operations enumerated subsequently, and which will prove a means of considerably accelerating operations. An American agricultural axiom is, that it is cheaper to hoe twice than once. This problem the practical farmer will be able to reason out, and will conclude it to be a wise feature in agrarian operations.

SOWING.

In common with most millets, the sowing of this seed, as usually performed by hand, is a tedious, unsatisfactory, and expensive operation. The common practice of drawing out drills by the plough, then dropping the seed by hand, or the alternative plan of dropping the seed every 3 or 4 furrows while ploughing, thus burying the seed with scant chance of resurrection from its grave, is too often a cause of disappointment. By adopting this practice, many a farmer has anathematised the quality of his seed for not germinating, when

the trouble frequently arose from his own method of sowing. It must be strictly remembered that to get an even crop a great deal depends upon how the sowing is accomplished. If the seed is dropped too scantily, a scanty crop is the result; if too thickly, a puny immature broom-head of little or no value is harvested. When sown too thickly, it may, of course, be thinned out; but anyone who has experienced the arduous work which this operation involves, when a large area has to be gone over, will hesitate before repeating the same error. When sowing, the object should be to have your stalks stand in the drills in the proportion of about 3 or 4 to a foot. This, it will be seen, needs some discrimination. In dropping the seed, to provide for contingencies such as immature grain, &c., the quantity of seed dropped must be much in excess of this, and, as a matter of practice, it is scarcely possible either with hand or implement to so graduate the sowing as to approach this proportion. Nevertheless, by the adoption of proper methods, aided by a little experience, the sowing of the seed may be done so accurately as to obviate any necessity for either thinning or replanting.

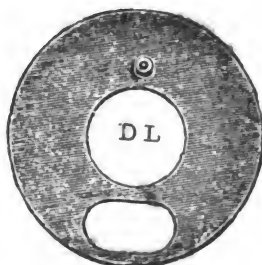
In sowing small areas, a little practice will enable the sower to drop the seed by hand in approximate proportion, but at best it is a slow operation, and anyone who wishes to cultivate this crop to any extent will do well to obtain a seed-sower adapted for the purpose, which will drill, drop, and cover at one operation.



"CHALLENGE" BROOM CORN SEED DRILL.



Disc.



Disc.

If using the Challenge seed sower in wet soil, precautions must be observed in keeping the wheel clean, as by the adhesion of soil altering the circumference of the wheel the speed of the discs is somewhat varied, and consequently the seed is dropped thicker or thinner in some places; also, care must be observed that soil does not clog the vent, as it will under some conditions, especially when working on waxy or clayey soils. Should the operator neglect to put his disc

apparatus in motion, or refrain from cleaning his machine, or fail to keep the requisite quantity of seed in the seed-box, the inference is that a very erratic crop must eventuate.

I have no doubt there are many good types of seed-sowers, notably some usually used by our maize-planters, that can be adapted for use. The planter I have used with success is the "Challenge" one-horse drill (here illustrated), with which I have sown some considerable areas of broom corn during the past two seasons, prior to which the sowing was done by hand. By the catalogue which I have at hand I learn that this drill is procurable in America as a two-horse machine that will operate two drills at once, thus much expediting the sowing.

As this machine is equally adapted for sowing maize and peas as well as the *Sorghum* family, the possession of one by the farmer will prove useful in the cultivation of other crops as well as the one under consideration. The only drawback is that the discs usually sent to this colony with it have not the regulation one adapted to sowing broom corn, which requires a disc with perforations more minute and in lesser number than the ordinary ones. In my own case, I had to perforate a spare plate, with the result, after some trials, of getting a regular standard of dropping, which obviated thinning or further replanting. Presuming that the farmer then contemplates sowing with a machine that operates thuswise, the first object is to get his drills marked out for opening. This, with a one-horse machine is no easy matter, as your horse will prevent your sighting your drill-sticks, so that, unless you can put two horses in your planter and view your guide-sticks as usual, it will be necessary to manufacture a marker. It is hardly necessary to impress upon the practical farmer the full advantage of straight, evenly divided drills. When cultivating between them with the horse hoe, drills that run either unevenly in space or crooked in direction are exasperating to the workman, inasmuch as his implement either overlaps or misses ground that should be stirred, all to the detriment of the crop. The better plan, then, to secure even, straight drills, suitable to the operation of the planter, is to construct a marker which will mark 3 or 4 drills at once. This marker can be easily constructed by placing the number of runners corresponding to the width of the drills required, and nailing or tenoning crosspieces to them to give rigidity. This, with a pole for a couple of horses, will be all that is needed. The ordinary form of slide often used by farmers, with the addition of a couple of runners, is as near the pattern of a simple land marker as I can describe. The illustration will show clearly what is meant.

HANDY CORN-MARKERS.

This implement is used for marking out the rows of maize or millets before planting. In Fig. 1 the runners are made of 3-inch plank, but, if this cannot be had conveniently, a good 1-inch board can be nailed or bolted to the side of 2-inch plank to give the necessary thickness. The runners are better made of

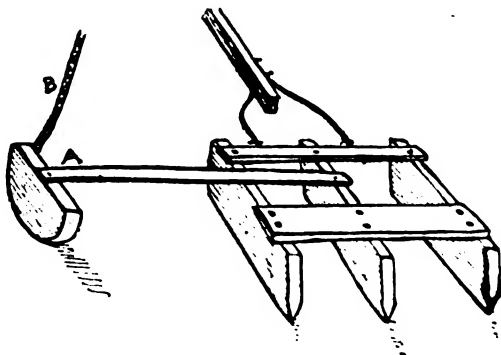


FIG. 1.—CORN MARKER.

hardwood, and should be levelled at the bottom into a sharp V, so as to make a distinct mark. We place the runners 3 feet 9 inches apart, and the extra marker (a) seen at the right hand runs just 7 feet 6 inches from the runner. This makes a guide-mark to follow, and enables the driver to make straight rows without the trouble of setting stakes each time.

The chain or rope (b) is fastened to the hame hook on the horse. This marker is secured by a single belt put in loosely, so that it will pivot around, and must be changed at each end. The part that makes the mark is made of 2-inch plank, with the edge bevelled sharp, and is just the shape and about the size of a half-head of a barrel. There must be a notch cut in each runner, or a strong bolt put in for the shank of this marker to rest against.

For the marker shown in Fig 2, use an old buggy or light wagon pole; if either are not available, make a pole as shown in the sketch, with two braces to the 2-inch. by 4-inch scantling roller, 12 feet long. For runners take a plank 2 inches thick by 6 inches or 7 inches wide; cut two of them 2½ feet long, two others 2 feet long; bore a hole with a 2-inch

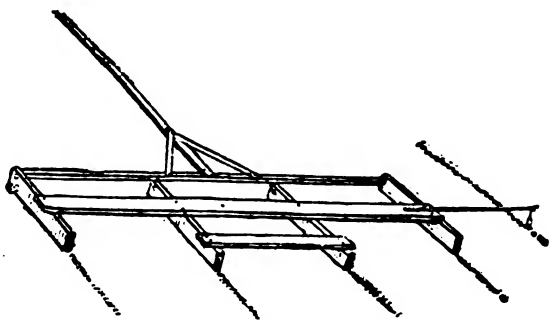


FIG. 2.—CORN MARKER.

suger in the two longest runners 5 inches from the ends. The runners may be rounded a little. Now nail a board, 5 inches or 6 inches wide, across runners—two small bolts in each runner would be better, but nails will hold them all right; also nail a short board on one end of two centre runners (see cut). This comes in handy to catch hold of to lift round at end of field. A man can drive a team much better than one horse. A good teamster can mark four marks at a time by using stakes, or a piece of stick nailed to the top board at the end, to which is tied a weight with a rope 1 foot long.

Now will be discerned the advantage of having prepared a good seed bed, as the marker, running over the smooth soil, will leave well-defined indications for the man operating the sowing-machine to follow. In the event of not being provided with the marker or seed drill, the farmer will need to draw his drills by the aid of his sticks in the usual way, drawing out two drills at double distance, and splitting down the centre. This saves some small amount of rod-marking. For broom corn, the drills should be either 3 feet or 3 feet 6 inches apart. In ordinary good soil 3 feet is, perhaps, the better distance.

The single-drill machine will sow, with drills 3 feet or 3 feet 6 inches apart, from 6 to 8 acres per day, doing the drilling, dropping, and covering at one operation. The value of mechanical planting over hand work lies not only in the expedition gained, but in evenness of dropping as well as in properly graded depth in sowing. In the ordinary operations of drilling with the plough, determine howsoever we may to draw evenly shallow drills, in practice the result is that, unless the ground is very smooth and deeply worked, some "grave holes" will be made, for ever precluding the germination of the seed. The depth to which the seed should be buried should not exceed 2 inches, indeed 1½ is sufficient. When drills vary in depth, the seed comes up irregularly, and there is a consequent irregularity in the maturing of the crop, all of which can

in some measure be avoided. When sowing by hand, it is sometimes recommended, in order to prevent too thick sowing, to mix the seed with wood ashes or dry earth; this to many will appear a cumbersome method, and unnecessary. Too much emphasis cannot be put upon this fact: That, in proportion to accuracy in sowing, drilling, and good tilth of soil, a material advantage obtains in efficient handling of the crops subsequently. In drawing the drills out, it is preferable, other circumstances being equal, in order to give the ground the best advantage of sun heat (it being continually borne in mind that this is a purely summer crop that revels in warmth), that the drills should be struck out north and south, thus as far as possible giving the best conditions of sun heat for rapid development of the crop. This feature being attended to, it will have some degree of advantage in the curing process, when the period for this work arrives. The sowing can be performed when the land is wet or dry. My own preference is to sow on dry soil, as then the machines work better; and as the seed is pretty hardy, it will keep, as I have found, for a couple of months awaiting rain to germinate: Thus the risk attending this crop is not nearly equal that pertaining to those crops of which the seed is expensive. The quantity of seed required per acre is about 6 lb., if dropped accurately. When dropping by hand, it will probably take more; and if the seed contains much immature or faulty grain, additional allowance must be made for this contingency. Care must be taken, if sowing with the machine, that all the seed is divided from particles of fibre and thoroughly separated; otherwise they clog the disc holes and thus prevent regular dropping, and, in addition, frequently germinate in clusters which dwarf the plants.

CULTIVATION.

The cultivation should begin almost immediately after sowing, as this plant is somewhat slow in appearing above ground. In suitable conditions of heat and moisture, it will usually be a week to ten days before the tiny spear protrudes. There is thus abundant time to set the harrows lightly skimming the surface to check such weeds as may be on the point of germinating. This service is performed by the harrowing, and is not of less importance than the benefit derived from the mulching process thus put into operation. The advantage of running the harrow over the ground up to the last possible moment is emphasised by the fact of the slow development of this crop in its young stages. In comparison with such crops as maize, it is quite laggard in its growth at this period; hence, if this operation is neglected, the weeds will prove formidable before you can safely work the implements among the tiny plants. Farmers not accustomed to this crop will, perhaps, be apprehensive of this peculiarity, but there need be no alarm. If other conditions are right the young plant will soon assert itself, and in a very short time give every evidence of vigour. In using the harrow after sowing, care must be taken not to displace the seed in the drills; neither must this operation be performed when the young plants are near coming up.

Begin operations with the horse-hoe as early as it is possible to move through the rows without doing harm to the young plants—that is, as early as you can operate the implements without fouling the plants with excessive soil. The careful tiller, when doing his first cleaning, will so steady his machine and horse as to be able to slightly throw light films of soil as near the roots of the young plants as he dare. This plan is of value, as providing a slight mulch close to the roots, and to some slight extent checks the growth of summer grass, which at this period is, as usual, too obtrusive. In black lands this film of soil has its value, inasmuch as it tends to prevent that serious drought propensity of black lands to open or crack, as it invariably does under these conditions to a material extent by its mulching properties. In cultivating black lands, no condition needs more guarding against than this feature of cracking. I am of opinion that this evil can be materially avoided by the deep and frequent use of the horse-hoe among the rows, and is a phase of tillage that no farmer in dry seasons can afford to ignore. No farmer need expect to perform what may be fitly called

the fine arts of cultivation without efficient implements to do the work with; and, furthermore, no farmer can afford to operate without a modern type of implement. Having in view the Planet Jr. type of horse-hoe with its contracting and extending features, it will prove invaluable for cultivation close to the plants. The shovels and tines of this type of machine can be adjusted to minimise hand labour considerably. Not only can the active workman use this implement to hill up, but when necessary, often by intruding on a drill where the seed is too thickly set, he can to some extent, if quick and careful, thin out plants while moving along. A little observation will very soon indicate what tines or shovels to interchange in the horse-hoe to perform the most perfect cultivation. There are some soils so heavy and waxy that at times it is most difficult to get such light tools as the Planet Jr. to operate satisfactorily. This, however, rarely happens, and usually occurs by too long delaying the first cultivation, and thus the soil becomes hard, cracked, and difficult to break up. Experience will soon indicate the advantage of having the drill drawn on symmetrical proportions; the opportunity for close cultivation to the plants, leaving but a thin line of unmolested soil in proximity to the roots, is sound evidence of practical work. This cleaning done with due care, as here suggested, will leave little or no hand labour to be done. This in itself is a considerable item when large areas are put in, or when farm labour is not always available. Although I have not invariably followed the custom, I quite hold that hilling the plants when they become 3 feet high or so—in fact, about the period of the last tillage operation—is to be recommended. The throwing up the earth, either with a light plough or with the shovel tines of the Planet Jr. set very angular, if the soil is loose, will do the operation satisfactorily. This will usually be the routine of cultivation needful for this crop. Surmising that the grower has thus far encountered a moderately favourable season, he will usually have arrived at the close of his tillage operations for the first crop; if the progress of the crop has been normal, the denseness of the foliage will be such as to preclude any further serious development of weeds, and the farmer's attention can now be concentrated on the next operation necessary—viz., that of "bending the broom-head."

PEA OR EARTH NUTS (*ARACHIS HYPOGÆA*).

By CHARLES BATTEN.

About three years ago, after reading an article on the above in the *Scientific American*, dealing with the cultivation of the peanut in the States of Virginia and North Carolina, I was induced to try its cultivation here (Pimpama) on a small scale.

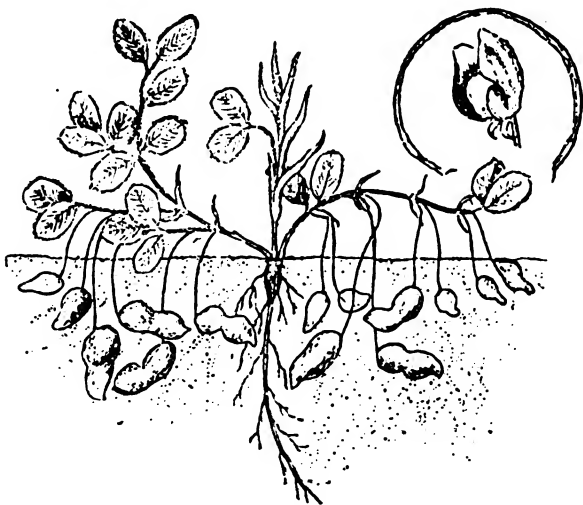
The third crop I have grown is now nearly ready to be harvested, and, as I have an enforced idleness through illness, I consider it well to give my experience for the benefit of my fellow-farmers, whom I certainly cannot advise to go in heavily for the cultivation of the peanut, for reasons they will notice further on; still they will not ruin themselves by cultivating a small plot.

The peanut requires a very sandy rich loam—if sandy scrub land, it will be all the better. The land should be as well cultivated as for potatoes, the drills struck out very shallow, 2½ feet between the rows, and the beans or nuts dropped from 12 to 15 inches apart. Of course the beans must be taken out of the pod, as there are two and sometimes three in a pod, and care must be taken not to rub any of the skin off the beans before planting, as they are then apt to rot in the ground.

They can be planted in this part of Queensland during September, October, and November. The main and essential point to be observed, in order to get a good crop, is to plant just as the land is in a nice moist condition to effect

rapid germination. If the land is too wet, or if heavy rains come after planting, then the seeds rot, and of course fail to grow. Again, if the land is too dry, many will not germinate, and the crop is poor and uneven. With the first crop I planted, there were a few misses, owing to dry weather; the planting was late, being in November, but still the crop was heavy.

The second crop was planted in September, just as I thought a nice little shower had come to germinate them, but I was disappointed, for it set in dry, and there were many misses; yet even then I had a fair crop. With the present crop, which is not yet harvested, I managed to hit the right time, and it was a pleasure to see the dark-green rows after they came through the ground, looking so beautiful.



THE PEA OR EARTH NUT.

The land must be kept quite clean with scarifier and hoe whilst they are growing vertically; for immediately the stems fall over and send rootlets into the ground producing nuts, all cultivation must cease, weeds or no weeds.

The leaves of the plant are much like those of clover, but larger. The flowers are yellow. A farmer visiting me asked why I was growing clover in rows. I asked him if it was a clover flower on them, and he then saw his mistake. When the plants are well covering the land, a patch of peanuts is a sight worth looking at.

When the crop is ripe, which is about the time of the first frosts in this climate, the tops or haulms must be cut off with a reaping-hook (it cannot be done with a scythe), and taken away for fodder for horses or cattle, who eat it greedily. The plough is then run under the rows of roots, which are picked up with the nuts on them, to be thrown in small heaps to dry for a day or two. They are then carted away to some shed or barn to be picked over at leisure on wet days.

The above is, however, not one-third of the crop. The land must be harrowed and ploughed as many times as the farmer likes, with a small crowd of children following with baskets to pick up the nuts. By this means one-third more of the crop may be saved. The best way to get the other one-third is to let the pigs root over the field.

Once they get a taste of them, they will work hard at it all day, with the exception of intervals to get a drink. I adopted this plan with my first crop. I had some trouble in getting them to begin on the first day, but after that,

when they were let out of the yard, they could get there quicker than I could. I need not add that the land was thoroughly turned over, but, even with that overhaul, I was surprised in the following spring to see so many plants springing up which the pigs had missed.

It only remains now for the nuts to be properly dried, for, if left in a heap when first gathered, they are apt to sweat. Those that are on the main roots must be picked off by hand, and the whole well sifted to free them from sand. They are then ready to be bagged and sent away to market.

The weight of a bushel of nuts is 22 lb., and about 90 lb. can be got into an ordinary corn sack. The quantity I grew would amount to about 90 bushels to the acre, besides what the pigs had. The question will now be asked whether the crop is a paying one for a farmer to enter into, and I am sorry that I had to come to the conclusion that it is not, and I will explain why.

In Virginia, U.S.A., there are farmers growing 10 and 20 acres, and the fruits are in common use in all the great cities of America; hence there is a demand for them. Here there is no demand, although the oil extracted from them is equal to the finest in the world, and, in my opinion, is far superior to olive oil. But the people of Queensland do not know the nuts; or if any do know them, they just know they are eatable, and are quite ignorant of the many uses they can be put to.

The Farmers' Alliance in America places the minimum price the grower is to get for the nut at 3d per lb., and that price will pay; of course, if the price goes up, all the better for the farmer.

On the strength of the above, when my first crop was ready, I went to Brisbane determined to get not less than 3d. per lb. I went to the produce merchants at Roma-street markets, but none came there for sale, and they could not name a price, although I knew that the retailers were selling them at 8d. and 10d. per lb. I was recommended to try some of the largest fruiterers' shops, which I did, and I had a very weary time of it tramping about Brisbane. I would rather be working on the farm any day.

I did not get an offer for any on that day. On another occasion, a fruiterer said he would take a bag, and he asked me the weight of it. When I said about 90 lb., he seemed frightened, and said he meant a sugar-bag, which I refused to send him.

I then tried a Chinaman; he offered me 1½d. per lb., but after much haggling I got 2d., delivered at his place. Asked how many bags he would take, he surprised me by saying, "Bringee all."

But my troubles were not over. I forwarded by rail, and then to my astonishment and disgust I found the freight came to about three times the ordinary rates.

On showing the consignment-note to John Chinaman, who could read English well, to my disgust he laughed at me, and showed me a consignment-note of nuts from his countrymen at Warwick; he had paid less railage from Warwick than I had paid from Nerang. Of course any who read this will wish to know how it is worked, but, instead of finding out from my own countrymen, I had to find it out from a Chinaman, and be called a fool by him in the bargain. It is very simple. Consign as *ground* nuts, not *earth* nuts, and they come under some other class. I asked "John" what he did with the nuts, and he told me that what was not sold in Brisbane was shipped to Thursday Island and China. I am of the opinion that it will pay a pig farmer to grow the nuts, provided he arranges for the pigs to do their own rooting. I am not a pig farmer, for I do not like the animals about the place. I consider the nuts cannot be grown and hand-cleaned to pay at less than 3d. per lb.—the minimum price in America.

MARKET GARDENING, No. 6.

By H. W. GORRIE,
Horticulturist, Queensland Agricultural College.

SALADS.

In every well-appointed garden a supply of salads should be always on hand, and this can be secured by planting a constant succession of suitable plants, each in its proper season.

The plants which may be used as salads are very numerous—beetroot, tomatoes, celery, and many others being largely availed of for this purpose. The common dandelion is in some European countries, and particularly in France, a universal salad; and several other plants, which are merely regarded as pests by us, are utilised by the thrifty French and Germans for the same purpose.

I propose to deal here, however, with those plants which are salads pure and simple, and are grown as salads and nothing else.

Of these, perhaps the most favoured and the most extensively cultivated is lettuce (*Lactuca sativa*), an annual plant which is a native of Southern Europe, Northern Africa, and Western Asia.

Our cultivated species of lettuce have all been evolved from *Lactuca scariola*, a variety which grows wild in each of the countries named. There are two distinct forms of lettuce now in general cultivation—the cabbage lettuce, which has round, closely-folded leaves, and flat firm heads; and the Cos lettuce, which has an upright habit of growth, with somewhat long and spoon-shaped leaves.

The Cos lettuce does not form a compact head, but by tying the leaves together at the top they can be made more tender and palatable than if left in their natural condition.

This variety obtains its name from the island of Cos, in the Grecian Archipelago, where it first originated.

Lettuce may be grown in the cooler parts of Queensland all the year round, but in the warmer districts its cultivation is attended with a great deal of trouble in the hot weather, and it will not attain the perfection then which it does in the winter. Whether in hot or medium districts, abundance of water is necessary to attain any measure of success. To keep a stock of lettuce always fit for use, a little should be sown once a month in a seed-bed, and planted out in good, rich, moist soil as soon as the young plants are large enough, which ought to be in 3 or 4 weeks after sowing.

They should be set out in rows about 18 inches or 2 feet apart, and about 1 foot between the plants in the rows. Where land is limited it is a good plan to plant lettuce out between cabbage plants. The lettuce will all be fit to use before the cabbages take up the whole of the space in the rows.

In order to have crisp, tender lettuce, the plants must be kept constantly growing and liberally watered in dry weather. Constant stirring of the ground around them with the hoe or cultivator will be of great help in keeping the plants on the move.

In hot weather lettuce is not so crisp as in winter, the heat rendering it somewhat tough, unless it is grown under a slight shade of some kind. In very fine, friable, loose soil the seed may be sown in summer if desired in the open ground, but if this is done care must be taken that the soil is not allowed to bake and become hard. Sow very thinly in shallow drills, and thin out to a few inches apart when the plants come up. Lettuce can be used in 6 or 7 weeks after sowing, and the plants should be about their best in 60 days.

ENDIVE.

Endive (*Cichorium Endivia*) is a species of chicory which is indigenous to the East Indies. It is a good deal like lettuce in appearance, and is a much esteemed salad worthy of being more extensively grown here than it is. Endive

can be grown nearly all the year round in pretty much the same way as lettuce, but it is necessary to tie the top leaves together in order to blanch them. If unblanched they are not very palatable, being somewhat bitter and tough.

The tying should be done on dry warm days when the leaves are dry, as if tied up when wet they will rot and decay.

Endive succeeds well, sown in the open ground, and subsequently thinned out to 5 or 6 inches apart, and should be ready for use in 45 or 50 days after sowing.

THE RADISH.

The Radish (*Raphanus sativas*) is an annual which has been in cultivation from prehistoric times, and is supposed to have originated in Southern Asia. Mention is made of the radish in Chinese books written more than 3,000 years ago. In England, the first record of the radish we have is in 1548, when it is spoken of by a writer on horticulture as a new vegetable which had recently come into use.

Radishes can be grown here all the year round, but in the very hot weather they succeed better if protected from the sun by a light shade. The seed may be sown broadcast, very thinly, and simply raked lightly into the soil, but the better way is to sow in shallow drills about 6 inches apart, and 1 inch or $\frac{1}{2}$ -inch deep. Rank new manure must not be used for radishes, and the soil should be finely pulverised and friable.

Light, sandy soil enriched with thoroughly decomposed manure will grow the best and most tender radishes. Sow some seed about once in 3 weeks to keep up a supply.

There are two distinct types of radishes—namely, long, and turnip-rooted or round; both of these require precisely the same treatment, except that the round kinds may be grown in shallower soil than the long-rooted varieties.

MUSTARD.

Mustard (*Sinapis alba*) is an excellent salad, and is easily grown.

In this country it can be cultivated in the open air in the autumn and winter, but requires a light shade in the summer. The seed may be sown in shallow drills 6 inches apart, or in boxes broadcast, and should be lightly covered, or merely pressed down into the soil. Germination will be greatly assisted by covering the box or drills with a piece of cheesecloth or similar material for a day or two.

The young plants, when from 2 to 3 inches high, are cut for salad.

CURLED CRESS.

Curled cress (*Lepidium sativum*) is grown in precisely the same way, and is also used in the same way. Mustard and cress are usually grown together, either the seeds being mixed or being sown at the same time close beside each other. Both should be sown pretty thickly, because they are used before the young plants begin to crowd each other. A little seed of each should be sown once a fortnight if it is desired to have some mustard and cress always ready for cutting.

WATERCRESS.

Watercress (*Nasturtium officinale*), which is a perennial plant, and a native of Great Britain, is a favourite salad everywhere. Although the natural habitat of this plant is in still water, yet it can be grown without much difficulty in a garden. The young plants may be raised from seed, but propagation is usually effected by means of cuttings.

To raise the plants from seed, an ordinary seed-box with plenty of drainage is used. This is filled with rotten manure and sand, and, after being smoothed and levelled, a thorough soaking with water is given, after which the seed is sown on the surface. The box is then placed in the shade, and the soil kept moist until the seeds germinate. In watering, a very fine rose must be used, so that the seeds will not be washed out. When the plants are a few weeks high they

should be transplanted to other boxes or to a shady bed, and when 6 or 7 inches long transferred to permanent beds. The beds should be made by digging trenches 10 inches or 1 foot deep, heavily manured, and dug over and smoothed and levelled in the bottom. The plants may then be set out about 1 foot apart. Abundance of water is necessary at all stages of their growth, and if treated in this way the cress should be ready to cut in about six weeks after planting. The planting should be done in the winter months, so that the cress may be well established before the weather gets too hot. Cuttings will also grow readily in the winter, and they should be grown in boxes, and afterwards transplanted in the same way as seedlings. To plant cress in a gully or waterhole, set the plants at the sides or bottom, and allow the stems to float on the water. The best place to plant watercress is beside a small gently-running stream or in a clean shady ditch; but as everyone cannot have these in his garden he must do the best he can. The overflow of a spring or well or the outlet of a land-drain are as suitable places as can be found in the absence of a stream.

With a little care and trouble, anyone can have a constant supply of salads of some kind, and the benefits of supplementing our too plentiful meat diet with fresh and wholesome salads are so great that it is difficult to understand why many farmers and others on the land hardly ever take the trouble to sow even a few radishes.

Dairying.

BY FRED. G. JONES.

(Read before the *Mungore Farmers' Association*, May 20, 1899.)

DAIRYING is a subject of world-wide importance, in consequence of which it is the most written about of any coming under the head of "Farming," so much so, in fact, that it is well nigh impossible to bring forward anything original. The highest authorities of Europe, America, and Australasia have been drawn on for information for the purpose of this paper, and all statements of fact may be accepted as thoroughly reliable.

Owing to the revolution that has taken place of late in the dairying industry, consequent on central butter factories superseding home dairies, dairying, as an adjunct of the farm, seems doomed to become a lost art, which will be replaced by milk farming.

The whole question may, I think, be most conveniently discussed under two aspects: The commercial one, showing what markets are open to us, and their capacity for taking our dairy products; and then the best means we can adopt to obtain and hold our own in them.

We will take the commercial view first, because the first question asked when any enterprise is about to be undertaken is—"Will it pay?" That question may certainly be answered in the affirmative, a comfortable living being obtainable, with but small chance of making a big fortune.

Thanks to the introduction of steam, ensuring quick transit, together with the provision of refrigerating chambers on the steamships, Queensland dairy produce may be placed on the English markets, which seem practically without limit at the most favourable season. The extent of this market may be judged from the fact that in 1896, which is the latest year for which I have been able to obtain statistics, the quantity of butter imported into England reached the enormous total of 340,250,000 lb., of which 137,000,000 lb. were from Denmark, and 52,000,000 lb. from France.

As showing the expansion of imports, Canada shipped to Great Britain in 1894 2,339,000 lb., and in 1896 9,896,000 lb.—an increase of 7,557,000 lb. And there can be no doubt that later returns will show a still greater increase. The consideration of how we are to benefit by this great market introduces the second part of this paper, and more properly relates to dairying. Of course the obvious reply to the question is: "Put a prime article on the market." But this is insufficient, as it raises the question of how that is to be done, and thus involves the breed of cattle best suited for the purpose, their feeding and treatment.

The subject of butter making and packing does not enter into the question, as the export trade can only be conducted by the factory. Now as to the best breed of cattle for dairying. This must to a great extent depend on the class of country in which the milk farmer is located. Generally speaking, there are six dairy breeds, each one of which has characteristics which make them specially suitable for different purposes—either butter, cheese, or milk. They are Shorthorn, Ayrshire, Holstein, Devon, Guernsey, and Jersey. The last two, however, are so nearly alike that for the purpose of this paper they may be considered as one, speaking of them as Channel Islands cattle. The Victorian Government dairy expert, in his work entitled "Butter-making in Theory and Practice in Australia," gives their yields in milk and butter per 100 lb of milk as follows:—

Shorthorn, 4,000 lb. of milk per season, with $4\frac{1}{2}$ per cent. butter. Ayrshire, 4,500 to 5,000 lb. of milk, with 4 per cent. butter. Holstein, 6,000 lb. of milk and 3 per cent. butter. Devons 3,000 lb. of milk, with $4\frac{1}{2}$ to 5 per cent. butter. Channel Islands cattle, 3,500 lb. of milk and 5 to 6 per cent. butter. Of these five breeds, the Shorthorn is a pre-eminently useful one, but, unfortunately, only does really well on rich and abundant pastures. In this part of Queensland, they are not A1. The Ayrshire, although a useful breed, is more suited for cheese than for butter farming. The Holstein, with its large milk yield of 6,000 lb. of milk per season, but with its poor yield of butter, is quite outclassed, except for milk-selling, where quantity rather than richness is the chief aim. The Devons are a very useful class, but their yield of milk is very small. Still, their hardiness and ability to adapt themselves to do well where larger breeds would fall away, while as steers they are among the best workers, and also make good beef, leaves them in a prominent position, so that they must not be overlooked.

There now only remain the butter breeds *par excellence*—the Channel Islands cattle, which have been bred in their native home for centuries for the one purpose of making butter; and where butter is the product required to attain the greatest success, Jersey blood, either pure or grade animals, must form part of the herd. A few extracts from good authorities may not be without interest. Willard says:—

"No one breed can be recommended for all situations, or to best suit the wants of all persons engaged in butter dairying. Farms differ widely in their character. Some lands have a level surface, others are rolling, and still others are broken and hilly. Soils, too, vary from the richest to the poorest.

"Again, one farmer wishes to make butter and cheese; another wants to get the best returns in butter, cheese, and beef, or in butter and beef; while a third is looking simply for the best butter yield alone. It is evident that no one breed will fulfil all these conditions at once and at the same time. As a general principle, it may be affirmed that good butter can be produced from any breed, and, not unfrequently, a common cow, with no renowned blood in her veins to boast of, will yield as much and as good butter as the boasted cow that has a long record in the herd-book. As a rule, it may be said that the small breeds give the richest milk. The Jersey and the Devon are, perhaps, the most noted in this regard. They do not yield so large a quantity as some other breeds; nor does it always follow that a cow yielding very rich milk will be the most profitable for butter-making, as a cow giving a larger quantity of average good milk may make better returns in butter.

"The Ayrshire gives a large quantity of milk of average good quality, but inferior in richness to that of the Jersey or Devon, and on some farms she may be the best butter cow. The same may be said of the Shorthorn.

"The Jersey cow has some characteristics not common to other breeds. She yields not only a very rich milk, but it is of a deep yellow colour, and the butter is of a harder and more waxy texture than that from other breeds.

"Among butter dairymen, the purebred Jersey or a dash of Jersey blood is very much esteemed. It is claimed that the butter from Jersey cows, on account of the peculiarities named, has a superiority which will command a better price than other butter. Much of the high-priced butter of Philadelphia is made from Jersey cows.

"The dairyman should have a clear understanding as to his situation, the character of his lands, and what he seeks to realise from his stock, and then choose that breed which is best adapted to his purpose. Not that a thoroughbred herd is indispensable; the cheapest and most practical course to be adopted will be to select the best common cows that are to be had, and cross them with a pure bull of the breed best adapted to his purpose."

From my own experience, I would not recommend a herd of Jerseys alone, the butter being too deep in colour. One in seven or eight is a very good proportion.

Now a few words as to feeding and shelter. Both are necessary, but shelter without stall feeding is better than feeding without shelter. So much by way of preface. Feeding to be profitable must be abundant; otherwise the cows will just hang about, and so do worse than when not fed. Then, again, the feed, whatever it may be, must be cheaply raised or there is no profit. It must not be supposed that because a cow is fed on a highly nutritious food, her yield of butter will increase in direct proportion. The real fact of the case is that every cow has a structural limit in the richness of her milk, and beyond this standard no amount of feeding will increase that richness. A cow that has not been fed up to that limit will, of course, increase until it is reached, and then will remain at a standstill. "Some dairymen are under the impression that exceedingly rich milk is made by excessive feeding, ignoring the fact that the real butter cow must be sought for in particular animals or breeds noted for this peculiarity." The same reasoning holds equally good as regards quantity of milk, which depends, not so much on the quantity of food eaten, as on what can be digested and made into blood, and the quantity of blood the mammary glands can convert into milk. As to the best food for dairying purposes, the first thing is variety, and in this respect good pasture is by far the best. For stall feeding, roots and green fodders of various kinds are admirable, and, if possible, the ration should always contain some bran or pollard or both, as they are both much above the standard value of food stuffs. Best meadow hay is taken as the standard, and is put down as 100, bran as 125, and pollard 115, so that, mixed in due proportions with poorer feeds, it is possible to make a standard ration. Of green fodders, the range is extensive. A capital mixture in Victoria, and no doubt in Queensland for the winter, is a mixture of oats, rye, barley, vetches, and rape. Rape is also very good mixed with other feeds, but needs to be used sparingly on account of its high nutritive value—197—and also because of the oiliness it gives to butter. Ensilage is, according to the trials made by Mr. John Mahon at the Gatton Agricultural College, and published in the *Queensland Agricultural Journal*, useless for milking cows,* although in hard times it will be valuable for dry stock, because if it does not feed it fills, and a cow must have its paunch full for the purposes of rumination. No hard-and-fast line can be laid down as to what is the best food; each dairyman must be guided by

* It was stated in the September (1898) number of the *Journal* that Mr. Mahon preferred green barley to ensilage as a milk-producer, but the ensilage he referred to was made of pigeon pea and green maize. In the November number he corrected the impression which had got abroad that he condemned ensilage altogether. On the contrary, he has always advocated its use "if made from sound materials, not rotten stuff," by which pigeon pea was understood. The College herd were at the time being fed on ensilage conserved from green oats and Cape barley with good results.—Ed. Q.A.J.

circumstances and as to what he can produce most readily. But there is one most important point which cannot be overlooked; and that is, water. It may be laid down as a fundamental principle that, without good water, it is impossible to have good milk. The truth of this may be easily seen when it is remembered that according to the analysis of Dr. Voelcker, the chemist of the Royal Agricultural Society, England, the composition of genuine cow's milk is as follows:—

Four samples are taken, thus showing what variation may be looked for.

| | 1. | 2. | 3. | 4. |
|-------------------|-------|-------|-------|-------|
| Water | 83.90 | 85.20 | 87.40 | 89.95 |
| Butter | 7.62 | 4.96 | 3.43 | 1.99 |
| Caseine | 3.31 | 3.66 | 3.12 | 2.94 |
| Mild sugar | 4.46 | 5.05 | 5.12 | 4.48 |
| Mineral matter... | .71 | 1.13 | .93 | .64 |

As to shelter, it need not be elaborate, but sufficient to keep the cows comfortably warm. Iron roofing is not, in my opinion, desirable, as it cools very quickly, and in winter that would be a state of affairs to be avoided; shingles or bark are preferable, though not so durable. On this point the dairy-farmer must use his own judgment, and so long as warmth and dryness are secured he cannot go far wrong.

PRINCIPLES OF SHEEP BREEDING.

No. 2.

By HERMANN SCHMIDT.

I HAVE tried to explain that the variable nature of our domestic animals is due chiefly to the fact that they are living under entirely different conditions than did their wild ancestors, and that by careful selection, and ultimately by inbreeding, we can produce great uniformity in their outer appearance as well as in their internal organisation. So that the desirable qualities which we have endeavoured to establish are now more or less constantly transmitted to the coming generations. Generally speaking, we must suppose that every peculiarity is more or less liable to be transmitted: the qualities of the body and of the mind, such as shape, size, and constitutional tendencies, disposition to diseases and other deficiencies, temperament, virtues, vices, and habits; but since our domestic animals possess the power of transferring their individuality personally in different degrees, and as they are still under the influence of those agencies which have caused their variability in the first instance, occasional deviations from their present form still occur, though rarely; these are called reversions or throwings back. In many cases it is difficult to ascertain whether any such new form is merely to be considered as the reappearance of a type which was common amongst the ancestors of the animals that show such a deviation, or whether it has been produced through the agencies of change of food, of superabundance of it, or of bad nutrition. Changes of climate, or other circumstances for which we cannot account, may also have caused them.

By reversion we understand the reappearance of peculiarities that have existed amongst the ancestors, as I have explained before. Infection means any effect on the mind, whilst impregnation implies the introduction of some organised substance into a female during the acts of conception or gestation. Under the head of infection would come such as Jacob's trick to obtain spotted lambs. Amongst the cases of remarkable deviations from the prevalent type there are some which admit of other explanations than that of reversion. I shall enumerate a few of these cases, and then give the explanations that have been suggested by various naturalists. We have here to distinguish between what may be called sports of nature and those malformations which may be attributed to imperfect development, such as hare-lip and other instances of the imperfect

union at the central line of the body during the fœtid existence of an animal, and some malformations cannot be accounted for in any way. According to the popular belief, fright and similar effects on the mind may cause malformations in the fœtus of a pregnant female. Some scientists attribute some of such phenomena to reversion, pure and simple; others to influences the nature of which is not clearly understood, and the name of infection or impregnation has been given to it. Instances of this kind are too numerous to deny their occurrence altogether.

Of a different kind are the following phenomena:—A brown mare of a race where this colour was prevalent, having been covered by a brown entire of the same breed, gave birth to a chestnut foal. It was ascertained that the entire had only lately covered a chestnut mare, the only one of that colour in the whole district. After the removal altogether of the chestnut mare from the district, the brown mare had several brown foals in succession by the same entire. This instance has been quoted as a case where a strong mental impression on the male exercised an indirect effect on the female. It is quite as possible, however, that we have here a case of reversion pure and simple. Some of the ancestors of either the male or female may have been of chestnut colour.

It is also maintained that such and similar effects on the female may be lasting. This is said to have been observed in countries where mules are bred and used in preference to horses. Dr. Miles's evidence on this head is abundant; it fills about fifteen pages of his work, but I shall here be able to give a few instances only. Mention is made in the "Philosophical Transactions" of the year 1821 of a chestnut mare, seven-eighths Arabian, belonging to the Earl of Morton, that was covered by a quagga; the hybrid produce resembled the sire in colour and in many peculiarities of form. In 1817, 1818, and 1821 the same mare was covered by a very fine Arabian horse, and produced successively three foals, and although she had not seen the quagga since 1816 they all bore his curious and equivocal markings.

It is stated, on the authority of Mr. William Goodwin, veterinary surgeon to Her Majesty, that several of the mares in the Royal stud at Hampton Court had foals in one year which were by Actæon, but which presented exactly the marks of the horse Colonel—a white hind fetlock, for instance, and a white mark or stripe on the face; and Actæon was perfectly free from white. The mares had all bred from Colonel the previous year.

Alexander Morrison, Esq., of Bognie, United States, had a fine Clydesdale mare which, in 1843, was served by a Spanish ass and produced a mule. She afterwards had a colt by a horse, which colt bore a very marked likeness to a mule. Seen at a distance, everyone set it down at once as a mule. The ears are $9\frac{1}{2}$ inches long, the girth not quite 6 feet, and he stands above 16 hands high. The hoofs are so long and narrow that there is a difficulty in shoeing them, and the tail is thin and scanty. He is a beast of indomitable energy and durability, and is highly prized by his owner.

Rueff says:—"As a horse-fancier I have taken special notice of such facts as they have come under my notice in my journeys through Piedmont, Upper Italy, and the South of France. Mares that have been covered by donkeys frequently produce, even when covered by a horse, offspring that so strongly resemble mules that they may easily be taken for such. The celebrated painter, Professor Wagner, noticed the same whilst travelling through Spain."

A German sheep-breeder, Mr. Rimpau, had 15 merino ewes covered by a Southdown ram; the offspring showed the grey heads and extremities of the Southdown ram. Later on the same ewes were covered by a Rambouillet ram; the result was that 12 out of 15 of those ewes produced lambs which were marked in a similar manner as the half-bred Southdowns—their mothers. Scientists have tried to explain these cases, as I said before, firstly, by a strong mental effect which the male exercises on the female; secondly, by a possible migration of the spermatozoa or seed animalcula into the ovary; or, thirdly, by the intermixture of the blood of the fœtus with that of the mother during gestation. With regard to the first explanation it may be said to be possible;

as to the second, it may be argued that such migration of spermatozoa from the vagina into the ovary has never been traced nor proved, and if it had taken place the effects would have been that more ovules would have come to maturity at the same time; the third explanation can scarcely be accepted, because according to some physiologists there is no true circulation between fœtus and mother, as had been supposed to exist, and that the fœtus grows by osmosis.

Dr. Carpenter says:—"Some of these cases appear referable to the strong mental impression left by the first male parent upon the female; but there are others which seem to render it more likely that the blood of the female has imbibed from the fœtus through the placental circulation some of the attributes which the latter has derived from its male parent, and that the female may communicate these with those proper to herself to the subsequent offspring of a different male parentage." Professor Agassiz seems to be inclined to hold the secondly mentioned explanation. He has shown that turtles begin to copulate at the age of seven years, but do not lay until they are eleven years old; they copulate twice each year for four years before the eggs are fully matured. Upon opening large numbers of young freshwater turtle of the species *Chrysemys*, it was ascertained that up to their seventh year the ovary contained only eggs of very small size, not distinguishable into sets; but with every succeeding year there appears in that organ a larger and larger set of eggs, each set made up of the usual average number of eggs which this species lays, so that specimens eleven years old for the first time contain mature eggs ready to be laid in the spring.

From the observations made by Agassiz it appears that the first copulation coincides with a new development of the eggs, in consequence of which a number of them, equal to that which the species lays, acquire a larger size and go on growing for four successive years before they are laid; while a new set is started every year at the period of copulation in the spring, enabling this species to lay annually from 5 to 7 eggs after it has reached its eleventh year.

After a careful examination of all the known facts bearing upon this interesting subject, Agassiz became satisfied that the first copulation only determines the further growth of a certain number of eggs, which require a series of successive fecundations to undergo their final development, and that in turtles a repetition of the act, twice every year for four successive years, is necessary to determine the final development of a new individual, which may be accomplished in other animals by a single copulation.

In a subsequent lecture, in speaking of the influence of previous impregnation upon offspring at a later period, Agassiz says:—"It therefore shows what I have satisfied myself to be the truth among other animals by numerous experiments: that the act of fecundation is not an act which is limited in its effects, but that it is an act which affects the whole system, the sexual system especially, and in the sexual system the ovary to be impregnated hereafter is so modified by the first act that later impregnations do not efface that first impression."

Darwin, in his "Animals and Plants under Domestication," cites a number of instances in the vegetable kingdom to show the direct action of the male element on the mother form, and he comes to the conclusion that "the male element not only affects, in accordance with its proper function, the germ, but the surrounding tissues of the mother plant." Further on, Darwin remarks: "The analogy from the direct action of foreign pollen on the ovarium and seed-coats of the mother plant strongly supports the belief that the male element acts directly on the reproductive organs of the female, wonderful as is this action, and not through the intervention of the crossed embryo."

Here we have a doctrine of great importance before us. For it is evident to every practical breeder that we might economise the services of valuable sires if we could place implicit reliance upon its holding good in every species, and under all circumstances. In the meantime, these facts may serve as a caution to be careful in never allowing a female to be mated with an inferior male, especially at the first time.

Reversion generally means the reappearance of the bad qualities of some inferior ancestors, and we say that animals are degenerating if the reversion to inferior ancestors has been so frequent as to threaten a total loss of the good qualities we desire to cultivate and to fix. I have known several flocks in Queensland where the traces of the good rams that had been used at one time had become completely obliterated, so to speak. Bad qualities had sprung up again and increased. Darwin explains the nature of this reversion or throwing back by the following illustration:—

“Some facts in regard to the colouring of pigeons well deserve consideration. The rock-pigeon is of a slaty blue, and has a white croup. The tail has a terminal dark bar, with the bases of the outer feathers externally edged with white, the wings have two black bars. Some semi-domestic breeds, and some apparently truly wild breeds, have, besides the two black bars, the wings chequered with black. These several marks do not occur together in any other species of the whole family. Now, in every one of the domestic breeds, taking thoroughly wellbred birds, all the above marks, even to the white edging of the outer tail feathers, sometimes occur perfectly developed; moreover, when birds belonging to two or more distinct breeds are crossed, none of which are blue or have any of the above specified marks, the mongrel offspring are very apt suddenly to acquire these characters. To give one instance out of several which I have observed:—I crossed some white fantails, that breed very true, with some black barbs, and it so happens that the blue varieties of the barbs are so rare that I never heard of an instance in England, and the mongrels were black, brown, and mottled. I also crossed a barb with a spot, which is a white bird with a red tail, and red spot on the forehead, and which notoriously breeds very true; the mongrels were dusky and mottled. I then crossed one of the mongrel barb fantails with a mongrel barb spot, and they produced a bird of as beautiful a blue colour, with a white croup, double black wing bar, and barred and white-edged tail feathers, as any wild rock-pigeon. We can understand these facts on the well-known principle of reversion to ancestral characters, confined, as far as I have seen, to colour alone, if all domestic breeds have descended from the rock-pigeon.”

It is thus evident that some animals possess a higher degree of transmitting power than others; but wherever the possibility of tracing back to the qualities of ancestors is at hand, we shall probably find that the ancestors of such animals were in possession of those qualities in a high degree of perfection and constancy of blood.

Such power is called “prepotency.” It means a higher degree of transferring power than usual. Some writers have maintained that “prepotency is a peculiarity apart from that power of transferring, which is the result of pure blood and high breeding; that it is the result, rather, of a peculiar organisation of the individual; and that it is, so to speak, a gift of nature, not to be credited to descent from a series of superior ancestors.”

However, there are no records in the history of breeding from which we are justified in presuming that such an individual prepotency really exists. In order to prove it, we must show authenticated instances that mongrels (*i.e.*, animals without claim to good blood) ever did become, owing to such individual prepotency, the progenitors of a permanently superior race of animals. Such proof has never been given. Some animals certainly show a superior power than others of transferring their own good qualities, and occasionally in a higher degree of perfection. Such facts, however, can generally be explained as the results of a greater accumulation of good qualities in the blood of the animals in question, as derived from good ancestors.

Settegast enumerates a number of instances where animals have produced exceptionally good offspring, in some cases much better even than they were themselves. The Shorthorn bull Hubback is credited by Settegast with that individual prepotency. It is well known, however, that Hubback was descended from the Teeswater cattle, a race then already famous for those very points which in a higher degree were the characteristics of Hubback. A few chance foals of very

superior qualities led to inquiries about the possible progenitor of them, and the circumstances pointed to a very old horse of unknown history. Here was (according to Settegast) a case of true prepotency. Closer examination of this equine Nestor revealed the well-known brand of a famous stud.

In such cases it has been invariably proved that these "prepotentiated" animals have sprung from *bonâ fide* blood ancestors.

It is easily understood how any herd or flock, that has been inbred for some time, will eventually reach a point where further improvements are either very slow or impossible. The system of inbreeding within a certain limit of qualities, and under the influence of the same food, climatic and other conditions, must have the effect of eventually precluding further variations, let them be ever so slight. Every improvement is to some extent a variation. Animals may have reached that standard of perfection, beyond which it is, under existing circumstances, impossible to bring them. If we now introduce a new sire of almost the same blood, but bred in an entirely different locality and under different conditions, the tendency to variation (though within certain limits) is introduced anew; and a fresh impulse is thus given to the formation of new characters. Of this the history of breeding gives numerous instances. It is frequently after the introduction of fresh blood of similar or the same descent that these prepotentiated prodigies turn up. Amongst the Australian sheep the appearance of some of them may be attributed to the Vermont blood (President ?); others to Staiger, Gadegast rams, &c.

Many breeders hold that the sire tends to transmit the average qualities of his ancestors. This is true up to a few generations backwards. The reappearance of less desirable qualities, as they existed in earlier generations, would be a case of throwing back.

The closer the animals to be mated are related to each other, the stronger will be their influence in transmitting their qualities to their offspring. If father and mother have an equal degree of transmitting power, they will have an equal influence on their offspring. The more equal both parents are, and the more similar their parents have been, the more perfect will their qualities be transferred to their progeny. The more unlike the parents are, and neither of them sprung from a constant breed, the more reversions will appear in their offspring for many generations to come. Darwin says:—"A breed intermediate between two very distinct breeds could not be got without extreme care and long-continued selection; nor can I find a single case on record of a permanent race having been thus established." If animals, sprung from violent crosses, are coupled with each other, sure results can hardly be expected; a deterioration generally ensues. Parents of different size and carcass will seldom produce an offspring of good proportions, also the products of coarse and fine-woolled sheep show always great unevenness throughout the fleece. If there are in a breed animals which answer the purposes of the breeder pretty nearly, favourable results of breeding, so far as the development and the increase of desirable qualities go, will better be accomplished by the inbreeding of such animals than by crossing them with others sprung from a different breed. The very existence of good animals proves that conditions favourable to the production of such animals are frequent, and exist *à priori* in the blood of this breed. The present qualities (good or bad) will, by inbreeding, be consolidated in course of time and be constantly transferred, while any admixture of other blood gives occasion to reversion on the part of the new blood. With reference to the French breed of Lacharmoise, the founder of it makes the following remark:—"Crosses have been tried for some time between French and English sheep, yet all our efforts and trials failed; nobody ever succeeded, as sometimes the English blood, sometimes the original French blood reappeared. I explained to myself this unsatisfactory result through my not paying sufficient attention to the law of inheritance, following which animals transfer their qualities according to the comparative length of time during which their ancestors have possessed these qualities. The English sheep, however, particularly those of the Leicester

breed, are of modern origin only; consequently they possess less individual capability of transmission than those of the French race, whose origin could be traced back for several centuries."

Thus I thought it advisable to diminish the resisting tendency of our French sheep against the transfusion of English blood into their offspring. In order to obtain ewes of no resistance against the English blood, I chose such ewes which originated from four different races of sheep in France, mixed them amongst themselves, and received at last animals without any distinct character or type, and which should possess the slightest possible inheritance. In this way I received lambs (got by the English Leicesters) which possessed 50 per cent. of Leicester blood, and $12\frac{1}{2}$ per cent. of either of those four French races. The French blood had thus to give way to the power of inheritance on the part of the English blood. The influence of the English type is indeed so decided and powerful that all lambs I bred in this way are considered to be pure blood English, and they perfectly resemble each other. Everyone of them which shows a remarkable reversion to the French race is culled, in order to improve the consolidation of the new race. This, he says, "is the mystery of the Lacharmois breed."

Le Fevre mentions a similar instance of the difficulty of producing a valuable breed from animals that have a tendency to reversion. The origin of the Mauchamp breed dates from the December of the year 1828, when Mons. Graux, the founder of the flock, noticed a ram lamb that distinguished himself from all the others through his good carcass and the length and the silkiness of his wool. He was called Soyeux (silky), and put to a most carefully selected flock of ewes more or less similar to himself. Amongst his numerous progeny of the first year there were only two ewe lambs perfectly like him. The best individuals of his offspring during the first and the following seasons were inbred with Soyeux himself, and one might have expected to be soon in possession of a new breed like Soyeux. Owing, however, to very many instances of reversion, it took fully eight years before any signs of constancy were visible. For more than thirty years it was considered doubtful whether the new Mauchamp flock would ever attain to that constancy of inheritance without which no breed has any value. It is worthy of notice that such lustrous-wooled sheep, as the ram Soyeux is said to have been, have not unfrequently been seen in other merino flocks, such as the French Rambouillets, and in some Victorian flocks. The Victorian lustre wool far surpasses that of the Mauchamp in quality, but I have not heard lately whether the establishment of such a lustre-wool merino flock has been successful in Victoria. It is evident that the elements of such a silky combing wool with good length must be latent or dormant in the merino. Some of the Ercildouns strongly reminded me of the samples of Mauchamp I have seen. The Mauchamps do not seem to be looked upon with favour, although their wool is exceedingly soft and silky. In all probability their transmitting power is too uncertain. To my knowledge they have never been imported into Australia, whilst other French merinos have been used with great success—particularly the Rambouillets.

From what has been said about the laws of inheritance, and the different circumstances under which the effects of them may be desirable to us or otherwise, we must naturally conclude that animals of near relation will transfer their qualities better than others, because they are descended from the same ancestors and their constitutions are similarly organised.

The highest authorities on sheep-breeding whose works I have read, and with some of whom I have come in personal contact, were unanimous in declaring that by carefully selecting suitable animals out of the same flock, by mating them judiciously, and by eventually inbreeding them, far better results may be obtained than by frequent freshenings up of blood. The following breeds, excellent in every respect, may serve as instances that it is possible to obtain results, desirable in every respect by inbreeding, although it is maintained by some that cohabitation of near relations produces in the human family weak constitutions, idiocy, &c.

The figures given here were taken from Dr. Weckherlin's textbook more than 15 years ago. This number may thus be added to those now given:—"The King of Württemberg's stud of pure Arabs have been bred exceedingly close for 60 odd years with good results—the best breeds of Dutch cattle for 50 years; the cattle of the Canton Schwytz, 40 years; the Swiss Gurteurind cattle, 60 years; the Simmenthaler cattle, 40 years; the merino flock of Achalm, 50 odd years. It is also the case with the most famous fine-woolled flocks of Saxony, Silesia, Moravia, and Mecklenburg."

Whether this applies to some of the best Tasmanians, I am not in the position to state. It has been stated that some of them have been Vermontised. That wonderful flock of Ercildoun, so far as the quality of its wool is concerned, which I saw at the hey-day of its greatest popularity (1867), represented then the unalloyed progeny of the old Campden as the result of careful selection and subsequent inbreeding.

So far as domestic animals are concerned, inbreeding, along with systematic selection, wherever anything like suitable material is present, has been proved to be the only rational method by which superior breeds with strong transmitting power can be formed.

The question of intermarriages between near relations—so far as the human family is concerned—does not affect the breeder of domestic animals. We know from our observations of the life of wild animals that the closest possible inbreeding frequently occurs, and that, in spite of it, the wild races are strong and healthy. We are thus justified in believing that, just as much as disposition to diseases and idiocy may be intensified in the progeny if near relations so constituted will intermarry, just so much will health, physical strength, and mental capacities be improved if the breeder persistently excludes any weak animals.

On the whole, I believe we are safe in considering that the good or bad effects of in-and-in breeding entirely depend upon the constitution of the animals. Strong and healthy ones will transfer good constitutions to their offspring. A tender and weak race that is bred in-and-in will soon come to an end. Of such instances the history of merinos furnishes many. Animals of bad constitutions should always be excluded from breeding, no matter how good they might be in other respects. In spite of what may be said against it, there is not the slightest doubt that in-and-in breeding affords us the only means of thoroughly consolidating an improved breed, so long as it is carried on with judgment, and is assisted by careful selection and good feeding.

Having expressed myself to a certain degree an advocate of inbreeding, I think I should also make a few remarks on what is generally termed crossing. In order to avoid any misconception about the meaning in which I intend to make use of that word, I shall settle, first of all, by clear definitions, a few terms which I shall be obliged to use pretty frequently. We must make a distinction between a cultivated breed and a pure breed, and we have to settle the question what is a breed. Breeds or races are varieties of the same species, which varieties, through having been under the same influence of climate, food, and method of living, &c., for years, have adopted certain peculiarities, and a general type of their own. We may say a breed is a variety that has become *sui generis*: for instance, the Maoris in New Zealand, the Japanese, the Shetland pony. A pure breed has never been mixed with other varieties. The Maoris and the Australian blacks probably descended from common progenitors, yet each of these nations, having lived separated from the other for a great number of years, have become distinct races. The safest test or the truest indication of their purity consists in the uniformity and constancy with which they transfer their distinctive characteristics. With reference to animals, this would chiefly apply to wild or semi-domesticated races; for instance, to the wild chamois goats in Switzerland and the original country sheep of Spain. Purebred animals are therefore the progeny of a pure breed in the sense I have explained. In speaking of pure merinos I mean that the sheep in question are the descendants of merinos that lived in Spain, and that have suffered no admixture of blood not originating from that country—for instance,

the pure offspring of Spanish merinos in England, Germany, France, America, Australia, or in any other country into which merinos from Spain have been imported. All these are pure merinos, yet some merinos in Australia or New Zealand may now be as different from those in Spain as is a Clydesdale from an Arab. The term "purebred animals" refers chiefly to purity of descent. A pure breed is, therefore, quite a different thing from a cultivated one. The latter is a variety produced by methodical selection and other proceedings on the part of man with the intention of accomplishing certain aims. "A cultivated" breed need not necessarily be a "pure" breed. For instance, the French breed of Lacharmoise, which I mentioned before, is a cultivated one, but avowedly of impure descent. If the term "cultivated" is to be applied, the animals referred to must possess uniformity in their external appearance, and constancy of transmission in the same degree, if possible, as wild animals. Until a breed of impure descent has really obtained all that, we can hardly be justified in calling it a "cultivated one." I should apply that term, for instance, to all the well-established breeds of English sheep as well as to many valuable French breeds, that, though of unknown descent, do now possess special characteristics that are transmitted with constancy, and that may thus be said to have become *sui generis*. Some breeds, again, may be cultivated and pure at the same time—namely, those, for instance, that have directly descended from pure Spanish merinos, and whose fleeces have attained a certain degree of perfection, owing to systematic selection. Such are all the highbred pure merino flocks in different parts of the world.

I hope to have succeeded in clearly defining the terms "breed," "pure breed" and "cultivated breed," and I shall now say a few words about "crossing." Dr. Manly Miles defines "crossing" as the pairing of animals belonging to distinct breeds, and in this limited sense it may be considered the opposite of in-and-in breeding. The same author expresses himself upon this subject as follows:—"As the dominant peculiarities of the purebred animal are developed by a system of vigorous selection and inbreeding in a certain definite direction, they will also as readily disappear and become latent if the opposite practice of crossbreeding is resorted to, and this is one of the most uniform effects of this method of breeding. If a cross of two distinct breeds is effected by the selection of animals of equal power in the transmission of their peculiar characteristics, the tendency is to make dominant the original characters that the breeds had in common, and to obscure the special qualities that constituted their distinguishing characteristics. The greater the contrast presented in the two breeds, and the greater the specialisation of their qualities through the development of artificial characters, the stronger is the tendency to obscure the best characters of each, and restore the original type from which they had been developed. In such cases the offspring would in all probability prove to be inferior in quality, from the inheritance of defects of both parents, without retaining the most desirable characters of either."

Professor Tanner remarks that "in the case of purebred animals there should be no opposing influence to weaken the hereditary tendencies of the offspring; but, on the other hand, a concurrent and sympathetic nature, so that the hereditary character may be confirmed and strengthened. Anything like a cross should be most jealously guarded against, as introducing a conflict of influences which impairs the character of the race."

It is generally admitted that in cases in which improvements are effected by crossing the greatest change is produced by the first cross, and that the improvement resulting from a repetition of the process is uniformly slight. This would undoubtedly be the case from the principle already presented; the greater the difference between the two parents, when one is prepotent in the transmission of its characters, the greater would be the resemblance of the offspring to the one, and the wider the divergence from the characters of the other parent; and, as the resemblance of the parents to each other would be gradually increased by successive crosses, the difference between the offspring and the inferior parent would as gradually be diminished at a similar rate.

Crossing is not, as a rule, the method by which the best breeds are produced. It is still resorted to, however, by owners of common sheep, in the belief that crossing with highbred animals affords a much easier and shorter way of improving a breed than selection and inbreeding. The latter, on the other hand, is generally followed in the very best and the most inferior flocks—in superior flocks, because there might be no obvious necessity of infusing another kind of blood, particularly considering the danger that the blood freshly infused might be followed by serious reversions. Very common flocks are inbred, simply because the owners do not think it worth their while to attempt improvements. In some cases crossing becomes imperative if a breed is comparatively free from the qualities we desire. The common merino flocks in Germany are produced through continued crosses of the common long-woolled country sheep with pure merinos. The mongrels so produced differ very slightly from their purebred ancestors on the side of the sire. There can be no doubt that we might succeed very well in making lasting improvements by continual crosses with superior blood if the general conditions are favourable. In a case like the one I mentioned, crossing amounted really to what might be called an entire subjugation of the inferior blood. Animals of the fifth and sixth generations, produced by fresh crosses, contain, practically speaking, scarcely any inferior blood at all, and they might answer very well for ordinary purposes; but we should certainly not attempt to use any of them for stud purposes.

If crossing amounts to nothing more than amalgamating two breeds that have derived their distinctive characters through selection and inbreeding, but have originally sprung from the same ancestors, it might be justifiable. If it were possible to amalgamate the densely woolled, regularly stapled, and well covered Saxon merinos with the longer stapled and open woolled sheep of Victoria, such as the old Ercildouns and similar types, we might eventually establish breeds of the highest possible perfection that can be attained. I for one doubt whether such an amalgamation would be successful, except after a long time, owing to the great constancy of transmitting which either of these breeds possesses.

Some breeders make periodical infusions of fresh blood into their flocks simply for the purpose of avoiding anything that might approach in-and-in breeding, for fear of destroying the constitutions of their sheep. I have already made suitable comments on that point. Others, again, keep on crossing individuals of two distinct breeds in order to obtain halfbred stock to be reared and fattened for the butcher. As the crossbred wool obtained from crosses between the heavy English breeds and merinos has fetched very satisfactory prices, many of such crosses have been carried out in almost every part of Australia, and the crossbred sheep do quite as well in North Queensland as they do in the Southern colonies. If that style of wool should be in permanent demand, and fetch good prices, it might be better to import an English breed out of which even a better style of that class of wool might be developed.

It is evident that those who are desirous of improving a breed by crossing will have to deal with the following questions:—1. What degree of inheritance does either of the two breeds possess? 2. Are the animals that are to be crossed very different in external appearance, and what kind of animals were the ancestors of either side with reference to the qualities we wish to cultivate, and to the degree of inheritance they are likely to exercise?

In the foregoing explanations I have tried to explain the general principles of breeding domestic animals, as they are—1st, based upon the results of scientific inquiries on the part of naturalists; 2nd, backed up by the most successful practical breeders. I shall now mention a few facts that will serve to illustrate the principle of transmission generally. It has been observed that "if animals of a common stock are crossed with thoroughbred ones, it mostly happens that the improving influence of the thoroughbred animals is chiefly noticed about the head, the neck, and the forequarters. The hindquarters are said to exhibit a greater tendency to resist the refining influence of the thoroughbred sire." From my own observation amongst sheep, I am inclined to think that

that this observation holds good. I have frequently noticed, particularly in new-born lambs, that the improvement in the quality of the wool derived from a wellbred ram is clearly visible in the parts I have mentioned, whilst the others remained coarse. A number of fine-woolled Negretti rams were put with a flock of comparatively mixed elements. A great number of the lambs so got strongly resembled the fine-woolled purebred rams about the head and the forequarters; the hindquarters were much coarser—in some cases even hairy. This naturally leads us to the question whether the male sex has a special influence on some portions of the body of his offspring, and the female on others. I mean whether the influence of either sex is confined to special provinces. Dr. Miles has devoted a whole chapter to the relative influence of the parents, yet the evidence collected by him is somewhat contradictory. Some cases in his evidence may be explained by reversion.

Animals of superior condition and health, particularly if they are active and lively, generally transfer their peculiarities better than torpid and sluggish ones; neither do very young and very aged ones transfer so well as those in the prime of life. Not only natural qualities are transferred, but those also which have been systematically developed through the will of the breeder. The evidence of a number of experienced dairy farmers seems to corroborate the notion that cows can be very much improved as milk-producers through frequent and careful milking, and also through a system of feeding being adopted that exercises a special developing influence on the udder calculated to keep it in healthy activity. It is reasonable to suppose that cows so treated will produce offspring of similar tendencies. Perhaps it might not be out of place here to mention that I have seen preserved in spirit, taken out of it, and shown to be handled—the genitals of a bull with a fully developed udder. I have no doubt this curiosity still exists in the Anatomical Museum at Berlin, where I have seen it on three different occasions, and I am prepared to bring authentic proofs of the apparently extraordinary statement which I have made. The fact in itself might be explained in several ways, and each of them has an interesting feature of its own. Let us suppose that the udder in question, which, according to Professor Gurlt's testimony, was moderately filled with a milky fluid when fresh, was nothing but an instance of reversion. If we wish to account for it in this way, we must suppose that the earliest progenitors of the animal in question, or, for that matter, of all our domestic animals, had udders and allowed them to be suckled. We are justified in supposing such to be probable from analogy, because there are tribes of birds where males and females do the hatching of the eggs in turns. The exceeding scarcity of such udders amongst the males at the present time might be attributed to discontinuance of their use—the teats are there still, and their size and position in the male are now considered to be good indications whether the daughters of such males are likely to be good milk-producers. Perhaps the existence of the udder in the case in question may be accounted for as the result of an effort on the part of the breeder to breed for large and good udders. The probably strong development of the mother's udder, and the judicious treatment of the animal on the part of the owner, exercised a favourable influence on the growth of the udder in the male calf.

In this case a valuable point has been artificially produced, and has become transmitted. A case is mentioned in the *Journal of the Royal Agricultural Society*, where the tendency of producing milk was very nearly lost altogether through not sufficient attention having been paid to this matter. Professor Tanner says he knew of a very striking instance of the loss of milk in a flock (previously celebrated for their supply of milk) being traced entirely to the use of a well-formed ram bred from a ewe singularly deficient in milk.

Dr. Miles says:—"It is well known to the breeders of Ayrshire cattle that the sire has an important influence upon the form and the functional activity of the udder, and the position and development of the false teats of the bull are believed to furnish an indication of the milking qualities he will be likely to transmit. In the large number of grade Ayrshires that I have bred for dairy purposes, the udder, in most instances, has resembled the family type

of the sire in form and general proportions. The males of the dairy breeds generally are prepotent in the transmission of the characteristics of the females of their race.

I shall now quote from the same source a few instances which prove that qualities acquired by habit, practice, or training are also inheritant.

A new instinct has become hereditary in a mongrel race of dogs employed by the inhabitants of the banks of the Magdalena almost exclusively in hunting the white-lipped peccary. The peculiarity of these dogs consist in their restraining their ardour, and attaching themselves to no individual animal in particular, but keeping the whole in check. Now, amongst these dogs some are found which, the first time they are taken to the woods, are acquainted with this mode of attack, whereas a dog of another breed starts forward at once, is surrounded by the peccaries, and, whatever may be his strength, is destroyed immediately.

A race of dogs employed for hunting deer in the platform of Santa Fé, in Mexico, is distinguished by the peculiar mode in which they attack their game. This consists in seizing the animal by the belly, and overturning it by a sudden effort, taking advantage of the moment when the body of the deer rests only upon his forelegs, the weight of the animal thus thrown being often six times that of his antagonist. Now, the dog of pure breed inherits a disposition of this kind of chase, and never attacks a deer from before while running; and even should the deer, not perceiving him, come directly upon him the dog steps aside and then makes his assault upon the flank. On the other hand, European dogs, though of superior strength and sagacity, are destitute of this instinct, and for want of similar precautions they are often killed by the deer on the spot, the cervical vertebræ being dislocated by the violence of the shock. Herbert Spencer says, in his "Principles of Biology": "Mr. Lewes had a puppy taken from his mother at six weeks old, which, although never taught to beg (an accomplishment his mother had been taught), spontaneously took to begging for everything he wanted when about seven or eight months old. He would beg for food, beg to be let out of the room, and one day was found opposite the rabbit-hutch, apparently begging the rabbits to come out and play."

Darwin says: "I find in the domestic duck that the bones of the wing weigh less and the bones of the leg more in proportion to the whole skeleton than do the same bones of the wild duck, and I presume that this change may safely be attributed to the domestic duck flying much less and walking much more than its wild parent. The great and inheritant development of udders in cows and goats in countries where they are habitually milked in comparison with the state of these organs in other countries is another instance of the effects of use." So far Darwin. I have mentioned on a former occasion that mental peculiarities are as much inheritant as those of the body. Weckherlin says that, according to his experience, "horses whose ancestors were easily trained are generally more docile than others." The horses in Arabia are certainly treated in a different manner to our Australian stockhorses. The gentleness and docility of the Arab horse are proverbial. Many of the qualities, however, which seem to have been artificially inculcated into the parent animals, and have reappeared in the offspring, have probably existed in the blood of the ancestors, and were merely *developed* through being cultivated.

With reference to accidental mutilations being inherited, Darwin mentions the remarkable case observed by Brown Sequard of epilepsy produced by injuring the spinal cord of guinea pigs being inherited. In his experiments with guinea pigs Dr. Brown Sequard observed that in those subjected to a particular operation, involving a portion of the spinal cord or sciatic nerve, a slight pinching of the skin of the face would throw the animals into a kind of epileptic convulsion. When these epileptic guinea pigs bred together, their offspring showed the same predisposition without having been themselves subjected to any lesion whatever; while no such tendency showed itself in any of the large number of young which were bred from parents that had not been operated upon.

Dr. Anderson, in his "Recreations in Agriculture," mentions the case of a bitch that was born with only three legs. She has had several litters of puppies, and among these several individuals were produced that had the same defect with herself. He states also that a cat belonging to Dr. Coventry, of Edinburgh, which "had no blemish at its birth, lost its tail by accident when it was young. It has had many litters of kittens, and in every one of these there was one or more of the litter that wanted a tail, either whole or in part." Blumenbach, as quoted in the "British and Foreign Medico-Chirurgical Review," affirms that a man whose little finger of the right hand had been nearly demolished and set awry, had several sons, all of whom had the little finger of the right hand crooked. I have many times wished to find out whether the docking of tails, which has been carried on amongst almost all the merino flocks in the world for a long time, has had the effect of lessening the number of the caudal vertebræ. The question is of interest to the physiologist, and therefore indirectly also to the breeder.

The practical part of sheep-breeding with reference to fine wool-growing will be treated later on. I may fitly conclude this chapter by quoting a passage from Shakspeare's "Winter's Tale," words which seem to embody in a few words all that I have said about the principles of breeding:—

Perdita : For I have heard it said,
There is an art, which, in their piedness, shares
With great creating nature.

Polixenes : Say there be ;
Yet nature is made better by no mean,
But nature makes that mean : so, o'er that art,
Which, you say, adds to nature, is an art
That nature makes. You see, sweet maid, we marry
A gentler scion to the wildest stock ;
And make conceive a bark of baser kind
By bud of nobler race ; this is an art
Which does mend nature,—change it rather ; but
The art itself is nature.

THE COLLEGE HERD.

It may be interesting to those farmers who take an interest in their dairy stock, and the yield of milk of individual cows, to read the following table showing the results obtained from some of the dairy herd at the Queensland Agricultural College, Gatton. The returns here given are taken from the College dairy registers, and we present them to our readers without comment. The figures only date from the time when the present Principal of the College, Mr. Mahon, took charge, and have no reference to dairy work prior to that time:—

| Name of Cow. | Breed. | Calved. | Dry. | MILK RETURNS. | | | | | | | | | | | | Total. | Average Test. | Equivalent in Butter. |
|------------------|----------|-----------|------------|---------------|------|-------|------|------|------|------|------|------|--------|------|-------|--------|---------------|-----------------------|
| | | | | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April. | May. | June. | | | |
| | | 1898 | 1899. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | | lb. |
| Rosebud ... | Ayrshire | 2nd June | 18th Mar. | 517 | 571 | 568 | 562 | 569 | 573 | 455 | 463 | 187 | ... | ... | ... | 4463 | 3.8 | 189.94 |
| Annie Laurie | " | 10th June | 20th Feb. | 366 | 475 | 381 | 367 | 392 | 339 | 332 | 185 | ... | ... | ... | ... | 2,731 | 3.9 | 119.28 |
| | | 1898. | 1899. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | | lb. |
| Opal ... | Jersey | 6th April | 28th Dec. | 467 | 481 | 479 | 453 | 345 | 259 | ... | ... | ... | ... | ... | ... | 2,482 | 4.0 | 111.19 |
| Eileen | " | 1st Aug. | ... | 467 | 543 | 569 | 541 | 536 | 510 | 364 | 375 | ... | ... | ... | ... | 3,905 | 3.8 | 166.190 |
| | | 1899 | 1899 | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | | lb. |
| Jersey Belle ... | " | 3rd Aug. | 28th April | ... | 420 | 478 | 473 | 495 | 501 | 523 | 458 | 389 | 227 | ... | ... | 3,954 | 3.9 | 172.71 |
| Content | " | 7th July | ... | ... | 339 | 458 | 478 | 480 | 510 | 496 | 517 | 471 | 428 | ... | ... | 4,177 | 3.9 | 182.44 |
| Stumpy | " | 26th July | ... | ... | ... | 68 | 572 | 654 | 689 | 765 | 739 | 627 | 516 | 489 | ... | 5,547 | 4.1 | 236.39 |
| Blink ... | " | 9th July | 27th Feb. | ... | 348 | 355 | 377 | 396 | 391 | 353 | 295 | 118 | ... | ... | ... | 2,633 | 3.9 | 115.0 |
| Lavinia | " | 20th June | 2nd Jan. | ... | 438 | 448 | 476 | 461 | 449 | 375 | 12 | ... | ... | ... | ... | 2,745 | 3.7 | 113.74 |
| Beam ... | " | 8th July | 20th Feb. | 457 | 480 | 497 | 475 | 496 | 484 | 273 | 123 | ... | ... | ... | ... | 3,315 | 3.8 | 191.08 |

CHANGES IN MILK.

CAUSES OF THE CHANGES.

THE following may give some little insight into the changes which take place in that important and distinctly unstable commodity, milk. Even the townsman, who from one year's end to another does not set eyes on the cow, knows that it is necessary to his comfort to have milk delivered at the door of his house twice daily, and at the same time has usually an idea, in common with the housewife, that the said milk will not "keep" for any length of time.

In the ordinary course of things, this change, although apparently brought about by certain conditions of warmth and aëration, or lack of the same, has as its root a cause which is dependent on these various conditions as to how its effects develop themselves.

The most noticeable thing about the milk when it is turning "bad" is that it becomes sour in smell and to the taste, and eventually turns into a mass of jelly-like clots floating in a thin, watery liquid.

CAUSE OF THE CHANGE.

The normal souring of milk is primarily caused by the presence of certain little living organisms termed by the scientist "bacteria." Of these bacteria there are many different kinds, producing varying results; but the special group of bacterial organisms which, in the natural outcome of things, produce sour milk in this fashion are known as lactic acid bacteria, their method of procedure being to change the lactose, or natural sugar of milk, into lactic, or milk, acid, and the presence of this acid so acts upon the casein, or coagulable portion of the milk, which otherwise is in solution, as to cause it to clot or curdle. If milk in such a condition is left to itself for any length of time, other species of bacteria acting upon it, each in their own way, cause it eventually to putrefy and decompose.

When some of these other kinds of bacteria obtain access to the milk in the early stages, curdling, if it takes place, may be due to their action; but they usually work, not, like the lactic acid bacterium, by manufacturing acid from the milk sugar, but by producing a rennet-like substance, which by its fermenting nature causes the casein to coagulate.

An instance of this nature is seen in butyric fermentation. Milk which has been boiled will sometimes coagulate under the action of this ferment, and when the milk changes in this way it becomes not acid, but slightly alkaline, in reaction. The changes are found to be similar to those effected by rennet, but a bitter taste is developed, and at last the coagulum clears, and butyric acid is formed.

DISEASES IN MILK.

Certain bacteria more approaching in nature the last-mentioned organism, and which are foreign to the milk, cause what are known as the various diseases of milk. A short summary of these is here given.

BITTER MILK.

Milk which possesses a bitter flavour may have derived it from the food of the cow, or bitterness may arise from the cow giving the milk being in bad health; but in some cases it cannot be traced to either of these causes, and is shown to be due to the presence of organisms which attack and change the nature of the casein, producing certain substances known as peptones, which probably impart the bitter taste.

Bacteria of this group are very tenacious of life, and so is explained the fact that boiled milk is especially liable to be attacked by them, the process of boiling having killed the lactic acid bacteria, which have considerably less power of resisting the heat. In fact, all bacteria, we may take it, are destroyed under these circumstances; but some of them, among which are those at present under consideration, can produce seeds, or, more correctly speaking, spores, which possess in a remarkable degree a heat-resisting strength, so that, passing

unharmful through the ordeal of boiling, they commence developing and multiplying as the milk cools, and having, by the destruction of all the healthy organisms, the field almost entirely to themselves, soon produce a characteristic effect on the medium in which they have their abode.

SLIMY OR ROPY MILK.

This disease, in which the milk becomes thick and slimy, is traceable to the action of a large section of germs, assisted by other organisms of a similar nature, being one of the many kinds of yeast.

Milk attacked by this disease will not cream, nor can it be churned. It is not at all nice for drinking purposes, yet in some foreign countries it is said to be liked as an article of diet, and is produced artificially by introducing into the milk the cut stem of a plant known as the butterwort. It is also reported that the same effect is produced by feeding the cows with this plant. The Laplanders are credited with these doings, and keep back a portion of the prepared milk in order to inoculate fresh milk with the ferment, just as we use yeast for brewing purposes, and under these circumstances are said to produce a confection quite delicious in taste. This plant (the butterwort) is found in some of our pastures, frequenting damp, boggy places; so it is possible that milk infected with the ferment may have derived the infection from the presence of this weed on the grass land of the farm.

BLUE MILK.

In this case the milk changes in such a way as to appear covered with blue patches, and this change takes place only after a primary, though slight, development of acidity. When the caseous matter of the milk curdles, the action completely ceases.

The first cause of such faulty milk is the access of filth, and in thoroughly clean and sweet dairies such a misfortune as the occurrence of this evil would be very rare. The organism implicated in this change is destroyed if subjected to a heat of 176 deg. Fahr.

RED MILK.

This occurrence, although it may be due either to the access of blood into the milk glands from a rupture of some of the bloodvessels in the same, or to food being eaten by the cow which contains a red colouring substance, such as madder, in its composition, is also occasioned by the development of a blood-red micro-organism. It is colonies of these organisms and their product which sometimes are so abundantly seen on potatoes rotting in store. They rarely obtain access to milk, but when such is the case they rapidly cause it to curdle, and sometimes produce a fishy smell and flavour.

YELLOW MILK.

This—another rare occurrence—results in the milk appearing of a brilliant yellow colour, in which the curd first produced is finally dissolved into an amber-coloured liquid.—*Farmer and Stockbreeder.*

The Horse.

STABLE NOTES, No. 3.

By W. C. QUINNELL, M.R.C.V.S.

DISEASES OF HORSES.

GENERAL TREATMENT OF HORSES IN DISEASE.

Bandages.—In febrile and inflammatory attacks, and during recovery from exhausting disease in horses, bandages to the legs help to maintain equable temperature and combat congestion of internal organs.

Warm Bandages.—Bandages for the purpose of warmth are made of flannel, and should be at least 3 yards long. With the view of maintaining heat for any long period, which is very beneficial to a sick animal, a little hay may be placed loosely round the legs before the bandages are applied.

The bandages should be removed at least twice daily or oftener; if the legs are cold, the limb or limbs hand-rubbed to restore warmth by friction; and then the bandages are to be re-applied at once.

Cold Bandages.—Chamois leather bandages are the best suited for this purpose, as they retain the moisture longer than any other. Linen bandages answer just as well when they can be kept constantly wet with water.

Sweating Bandages are very useful in reducing enlargements, and to gain their full effect a sweating bandage should be made by covering a wet linen bandage with any material that prevents evaporation, such as waterproof sheeting or oilcloth. After such a bandage has been applied for some days, an ordinary cold bandage should replace it, otherwise the skin is apt to become hard and fissured.

Fomenting Bandages consist of a flannel bandage soaked in hot water, which is rolled round the limb, and, as in the sweating bandage, must be immediately covered by non-porous material; and over these apply a dry bandage. By this method warmth and moisture will be retained for a considerable time.

Baths.—The value of baths for the preservation of health and for cure of disease amongst the domesticated animals has never, we think, been fully appreciated.

It is very desirable to change the diet frequently in sickness; horses soon become tired of any particular food. It is useless attempting to force food on a sick animal until he shows some inclination for it. When extreme weakness has to be combated, strengthening, stimulating, and easily digested food must be given, such as milk, eggs, stale bread, biscuits, &c. A quart of stout, ale, or porter may be given two or three times a day. Scalded oats, with a little salt added, will tempt sick horses when they have refused all other food, and this will also be found beneficial when convalescence is nearly completed.

Water.—Unless affected with diarrhœa, dysentery, or diabetes, animals do not injure themselves by taking too much water or watery fluids, but are often rendered uncomfortable, while recovery is retarded, by undue restriction. A supply of water should always be within the patient's reach. Cold water never does harm, and is more palatable and refreshing than when given tepid.

Grooming.—Little of this as possible, so as not to inconvenience or irritate a weakly patient. Take off the clothes; shake or change them once a day; gentle hand-rubbing of the skin and also sponging of the nostrils and dock, and in some cases the whole body, with weak vinegar and water are generally refreshing to a sick animal.

Exercise.—Although it proves a health-restorer, improving appetite and promoting the several excretory functions, care must be taken that it is not ordered too early or carried to excess.

A few lines on the curative advantages of *tepid*, not cold, water would perhaps not be out of place here.

Cold Baths (temperature of 60 degrees Fahr.), when judiciously used, are in many cases very beneficial.

The cold bath gives tone to and braces up the strictures of an animal which may have become weak or deficient in vital energy, and nothing conduces to obtain these effects so readily as a bath in the sea, which, owing to its saline ingredients and the constant movements of the waves, is more exhilarating than fresh water at rest.

Healthful reaction is further encouraged by thorough drying, hand-rubbing, and clothing.

Tepid Baths (from 65 degrees to 85 degrees Fahr.)—Irritating or noxious matters are removed from the skin, circulation is equalised, excessive temperature reduced, thirst is allayed. Such baths are, therefore, grateful to heated and over-taxed horses.

Warm Baths (from 85 degrees to 95 degrees Fahr.)—They soften the skin and thus relieve irritation and itchiness in animals with skin disorders, remove stiffness, and are useful in promoting comfort.

Hot Baths (from 95 degrees to 110 degrees Fahr. if gradually increased).—They soothe animals which have been subjected to severe muscular strain, useful in the relief of cramps and colic, benefit chronic skin diseases, and check chills, colds, rheumatism, &c.

Medicated Baths, when impregnated with suitable medicants, are found to be of great importance in the treatment of skin disorders and in the destruction of skin mites or parasites.

Food must be provided in sufficient amount, of suitable quality, and appropriate to the requirements of each case. As the appetite of a sick horse is as a rule delicate and capricious, food should only be offered in small quantities, and that which is not eaten should be removed after having remained a few minutes before the animal. Hay or any other food on which the sick horse has been breathing should be thrown away and not offered to him another time.

Poultry.

DUCKS.

SINCE the appearance of an article entitled "Hints on Duck Farming," in this *Journal*, we have had several inquiries as to the comparative merits of fowls and ducks as layers, sitters, and as profitable stock for export. One or two correspondents declare they will have nothing more to do with ducks. The eggs, they say, are laid anywhere about the yard or paddock. The young ducklings rarely survive, &c., &c. Now, this can but be to a great extent the fault of the owner. All live stock require not only attention, but they also demand a knowledge of their habits, diseases, and generally of the methods to be adopted to insure success in the business. Whether the stock consist of bullocks or bees, horses or hens, pigs or ducks, the man who hopes to succeed as a stockowner, and yet is absolutely devoid of any knowledge of stock, is doomed to fail.

Now, here we have the experience of a South Australian gentleman in the matter of Indian runner ducks, which should satisfy anyone that raising this class of bird in a systematic and careful manner is a paying concern. Mr. S. H. Pitman communicated the following to the *Adelaide Farm and Garden*, and we recommend our correspondents to study the results :—

INDIAN RUNNER DUCKS.

A YEAR'S RECORD.

After 18 months' experience with the Indian runner duck, I am more than satisfied with them. They have in every way fully demonstrated their excellent reputation, being very quick to mature, good foragers, and marvellous layers, as the accompanying list shows.

I commenced hatching young ducklings in July last, and continued all through the summer and autumn with good results; those hatched in January, February, and March matured well, thus proving that, with ordinary care, they can be reared all the year round, and by so doing ensure a constant supply of eggs.

I shall be pleased to give any information as to feeding, housing, &c.

RECORD OF LAYING OF NINE INDIAN RUNNER DUCKS.

(Hatched 16th November, 1897.)

| Day. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| May | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| June | ... | 3 | 4 | 4 | 6 | 5 | 3 | 5 | 5 | 2 | 5 | 3 | 3 | 2 | 3 | 6 | 6 |
| July | ... | 7 | 7 | 8 | 9 | 8 | 9 | 8 | 8 | 9 | 6 | 6 | 7 | 5 | 6 | 7 | 7 |
| August | ... | 7 | 8 | 8 | 8 | 8 | 8 | 9 | 8 | 5 | 8 | 7 | 8 | 8 | 9 | 9 | 8 |
| September | ... | 8 | 8 | 7 | 8 | 7 | 6 | 8 | 8 | 9 | 7 | 6 | 9 | 8 | 8 | 7 | 9 |
| October | ... | 8 | 8 | 8 | 6 | 8 | 7 | 8 | 9 | 8 | 8 | 9 | 9 | 8 | 9 | 9 | 7 |
| November | ... | 9 | 8 | 8 | 8 | 6 | 6 | 7 | 5 | 7 | 6 | 6 | 9 | 5 | 9 | 8 | 8 |
| December | ... | 8 | 6 | 9 | 8 | 6 | 5 | 6 | 5 | 5 | 4 | 5 | 6 | 5 | 7 | 5 | 6 |
| January | ... | 3 | 5 | 5 | 3 | 4 | 6 | 4 | 6 | 4 | 3 | 6 | 5 | 5 | 4 | 5 | 4 |
| February | ... | ... | 1 | 1 | 2 | 1 | ... | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 |
| March | ... | 1 | 1 | ... | ... | ... | ... | ... | ... | 1 | ... | 1 | 1 | ... | ... | 1 | 1 |
| April | ... | 2 | ... | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 5 | 2 |
| May | ... | 7 | 4 | 4 | 8 | 9 | 8 | 9 | 6 | 6 | 6 | 7 | 6 | 8 | 7 | 7 | 5 |

| Day. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. | 29. | 30. | 31. | Total. |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|
| May | ... | ... | ... | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | = 25 |
| June | ... | 5 | 6 | 6 | 6 | 5 | 4 | 5 | 7 | 7 | 8 | 9 | 5 | 8 | = 151 |
| July | ... | 5 | 6 | 6 | 7 | 8 | 8 | 7 | 5 | 4 | 4 | 5 | 5 | 5 | = 206 |
| August | ... | 9 | 8 | 9 | 9 | 8 | 9 | 9 | 8 | 9 | 8 | 7 | 5 | 6 | = 248 |
| September | ... | 8 | 8 | 9 | 8 | 8 | 9 | 7 | 8 | 7 | 8 | 9 | 8 | ... | = 234 |
| October | ... | 8 | 7 | 9 | 8 | 8 | 7 | 8 | 8 | 8 | 7 | 8 | 9 | 9 | = 249 |
| November | ... | 8 | 8 | 9 | 6 | 4 | 5 | 6 | 4 | 5 | 5 | 7 | 9 | ... | = 205 |
| December | ... | 6 | 6 | 7 | 6 | 6 | 5 | 4 | 5 | 6 | 3 | 3 | 4 | 3 | = 169 |
| January | ... | 5 | 2 | 2 | 3 | 4 | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | = 111 |
| February | ... | 2 | ... | 1 | 1 | 1 | 1 | ... | 1 | 1 | 1 | ... | ... | ... | = 32 |
| March | ... | ... | 1 | ... | 1 | ... | 1 | ... | 1 | ... | 1 | ... | 2 | 1 | = 15 |
| April | ... | 5 | 6 | 6 | 6 | 6 | 7 | 6 | 5 | 5 | 6 | 8 | 4 | 6 | = 110 |
| May | ... | 8 | 7 | 7 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | = 136 |

1,891

Grand total, 1,891.

Average of 210 per duck.

Average weight of egg, 2½ oz.

Total weight of eggs produced, 295 lb.

The nine young ducks hatched August have laid 753 eggs for the first five months of this year.

FOWLS IN CONFINEMENT.

OVERFEEDING and lice are the two causes of most disasters to poultry, and as neither of them are diseases, poultrymen are to blame for all the many consequences that follow upon their heels. Poultry in confinement must be fed differently from those which have a free run of grass or woodland, in which latter they revel, hunting over all the leaves, and scratching away, around and under old logs, for their favourite grubs and bugs. If you have not made it a business to watch your hens and chicks carefully you do not realise what a large amount of grass and green food they will eat in a day, when it is at hand, and when they have not been overfed with grain or scraps, and this is not all, as hens need rough food or something that gives bulk as well as nutriment. Even though you feed the confined birds the same identical food they obtained for themselves on a good run it would not be the same, as they would still lack the exercise so necessary for their health, and, therefore, in confinement, the same food would be too much for them. This is why successful raisers of poultry in confinement always throw the grain to their fowls in straw, thus compelling them to work for it; also hanging a cabbage-head just out of standing reach, so that they must jump for every pick at it. This is a good system, and exercise is necessary for their health, but if the food was composed more of nitrogenous elements, and less of the carbonaceous (especially of the oils and fats), there would not be so much necessity for this constant training down process, less over fat hens which stop laying and want to set, less

sluggishness in the yards, and more fertility in the eggs. There are still people in this enlightened age who stuff their chickens, both old and young. Now corn is useful in the poultry business, as lard or bacon is in the kitchen, but not as a regular diet. If you want to fatten poultry or warm them in cold snapping weather in winter, or when a hen is poor and on that account not laying, and needs a little help, &c., corn is just the thing, and the yellower the better; but as a general diet it is about as bad a thing as you can give, especially when fowls are confined.—*Vermont Farm Journal*.

FLAVOUR IN EGGS.

How does it happen that often a cook finds that more eggs are required this week for certain dishes than were required last week? The cause of this is, or should be, well known to poultry breeders. It all lies in the feeding, on which much of the flavour of the egg depends. In some backyards of the city and suburbs there are poultry which rarely taste any grain. They are fed mainly on the waste scraps of meat and vegetables and bread. Now, examine the yolk of an egg, the layer of which has been fed exclusively on meat, and compare it with that of a hen which has plenty of milk fed to it. The yolk of the first is dark in colour, and the flavour is too strong for people with a delicate palate. The milk-produced yolk is very pale in colour, the white looks milky, and the texture soft, whilst the flavour is insipid, and the eggs are of far less value for culinary purposes than those laid by fowls fed on a mixed diet of corn and greenstuff. Hens require a considerable amount of food to enable them to bear the strain of laying an egg every day. Still they should not be neither stuffed to repletion nor half-starved. Many young amateurs feed too much to the detriment of the egg-basket. The best way is to give plenty of greenstuff such as thistles, lettuce, cabbage, &c., and then let them have all the grain they are willing to scratch for. Hens should always be made to work for their living. If grain is scattered in a dry manure heap, in the farmyard, searching for it will give them profitable and healthy employment.

POULTRY NOTES.

TO TELL AN OLD FOWL FROM A YOUNG HEN.

IN lifting up the wing, and pushing aside the feathers of the sides, you will find in the case of a young hen a long down, light and close, arranged regularly between the other feathers which cover these parts of the body. Through the skin, which is of a delicate and rosy tissue, the very small blue veins will be apparent. In a hen more than a year old, the down and the veins will have disappeared, the skin is of dull white, and dry, less smooth, and somewhat farinaceous looking. The smooth leg, with bright scales, is also one of the best indications.

Give lime for growth of bone and for egg-shell material.

A little cayenne pepper in the food often stimulates laying.

A laying hen should have her food and drink at regular intervals.

If the hens show an inclination to pull feathers, give them salt pork.

It is essential that confined fowls be supplied with plenty of gravel.

Intelligent management and feeding are as necessary with chickens as with other stock.

PRINCIPLES OF CHICKEN RAISING.

The fundamental principles of raising chickens are judicious feeding, good housing, with plenty of fresh air and exercise to induce development. Under no circumstances will they stand coddling, nor must they be considered delicate because they are young and small. If from healthy stock, they will when hatched be strong and active; it remains with the breeder to keep them so.—*Country Gentleman (Albany, New York)*.

FEEDING FOWLS.

Touching on maize, how common it is still to see the farmer's wife keep on day after day, year in and year out, feeding nothing except this to her poultry. No greater mistake can be made than this. Maize alone is neither good for the laying hen or fattening bird, and we would strongly advise those so persistent in its use to desist. Don't by any means stop feeding maize altogether, as this also would be a mistake, as it is a cheap and valuable food. Feed it in conjunction with other grain, such as wheat, barley, and oats, according to price. It is best not to mix different sorts of corn together, but feed them each alternately—say, one one day, and another the next. Fowls are usually passionately fond of maize, and will pick it out first, and perhaps leave the rest, if a mixture be given. Laying hens fed solely on maize go off in their yield, as the egg organs are very liable to become fattened up by this food.

The Orchard.

SOUTH AFRICAN FRUIT.

MR. D. O'CONNOR, Duporth, Oxley, forwards us the following extract from the *Spectator* on the subject of the British imports of fruit from South Africa. A perusal of the article should afford much encouragement to our Queensland fruit-growers, aided as they are in their work by expert advice:—

Queenslanders in general, and fruit-growers in particular, are greatly indebted to the Agricultural Department for their enterprise and generosity in helping to instruct our orchardists in the production of good fruit. The various climates and soils of our colony are capable of producing in excellence nearly every known fruit. Our markets already show improvement in the quality and abundance of Queensland fruits, but there is still great room for improvement. Too many inferior trees are allowed to encumber the ground; these should be eradicated and replaced, after the ground is properly prepared, by the finest kinds procurable. It is useless to export inferior fruit; the best alone will pay. The enclosed extract from the *Spectator* should give some encouragement to our growers. When on a visit to the Cape some time ago, I was surprised at the high quality of the fruit, especially the apricots, grapes, and peaches. The *Spectator's* encomiums are quite justified.

During the last month (April) connoisseurs in fruit have had the opportunity of enjoying what is to most a new luxury. This is the finest fruit of Cape Colony, some of which has been placed upon the London market. There are still great difficulties in the way of its transport, as freezing destroys it, and the maintenance of a cold chamber at a proper temperature gives more trouble than the steamship companies like. But what does arrive in good condition is incomparably good. The large heart-shaped plum as full of juice as a peach, apricots with a double share of apricot flavour, peaches without a suspicion of the bitterness of Californian peaches and Williams' Bon Chrétien pears, are the most prized varieties. There are also three kinds of grapes, small black cluster grapes; and two large varieties, with Muscat flavour, one black and the other white, all grown out of doors, but not inferior to English hot-house grapes.

The Cape has a great advantage over California for profitable fruit-growing. Its seasons are the converse of ours. While we are freezing, the South African sun is ripening the orchards and vineyards of the Old Colony. Nature does so much for the Cape farmers that we wonder that they have not done more for themselves. The perfect climate produces the fruit of a flavour unsurpassed in quality, and in quantities as great as Nature almost unassisted will grant. In January, when dessert on English dinner-tables is supplied

mainly by the dried fruits—the raisins of California ripened in the previous summer, dried plums from Bosnia, or dried figs from Ionia, with only the orange and expensive hot-house grapes to give juice and lusciousness—the colonists are picking the last of the strawberries and apricots for themselves, and making ready for sale or export exactly the kinds which those who are compelled to eat dried fruit here and in the United States would welcome most eagerly. Early grapes, exquisitely flavoured pears, early peaches, fresh figs, plums of a size and flavour surpassing any grown in this country except in the hottest summers, are ripening on the trees of the “Old Colony.” February at the Cape produces the finest kinds of English peaches and nectarines, mainly of the late-ripening varieties, which are, as a rule, the very best in flavour, even of those choice fruits. The difference is that what can only be grown in perfection under glass here, or under exceptionally sunny walls in favourable seasons, is there produced in abundance on standard trees. This fruit can be in London within a month of being gathered, and packed in cold chambers is brought here with the bloom still on the plums, which look and taste as fresh as if gathered in the garden. This is at a time when the east wind is whistling through the trees, and not a bud has yet appeared on our own plum and peach trees. It is in February, also, that the Cape grapes come to perfection, and have the best and truest flavour. Of these the Colony produces one kind in rude abundance, and does produce a few, and might produce a great quantity, of very high quality. Wine-making is an ancient industry at the Cape, and the most remarkable thing about the Cape Colonist's wine is that, though it has never been properly managed or developed, the growers have always succeeded in producing *one* wine of high quality. This is the Constantia, which has in it the guarantee, which no one seems ever quite to have accepted, that the Cape climate can bring to absolute perfection the essential vinous constituents of the grape, which no other country is quite known to do except the port-wine growing district of Portugal. Roasting sun, good soil, and something else, probably a very dry, pure air, do this, and there always has been a district of the Old Colony where these natural qualities of soil and climate were so far appreciated as to make vineyard planting a staple industry. But it is one thing to grow grapes for wine, and another to grow them for the table. At the present moment there are tons of little black vineyard grapes arriving from the Cape. Their condition and taste are an object-lesson both as to what the Cape can do and what it might do. These are of first-rate flavour, but of all sizes, unthinned, crowded on the clusters, with many half-ripe inside the bunches. They are, however, pleasant to taste, and remind the buyer of the days of vintage abroad. Their flavour is also evidence of how excellent they might be, if properly pruned and thinned. Later, in April, very fine white, or rather green, grapes, grown well and carefully packed, come from the Cape. They are of medium size, of a beautiful clear green like chrysoprase. The flavour is not that of Muscat, but is excellent of its kind.

For early winter fruit the Cape also contributes varieties which are most welcome at that season. Figs ripen in November, and there is practically an unlimited market for fresh figs in London. The Cape colonists are anxious to develop a business in dried figs, so that they may rival Smyrna. The Karoo is looked upon as the future centre of fig-growing and drying. It is intended to introduce the fig-insect which assists in bringing the Smyrna figs to perfection. But we think that before this industry is developed the trade in fresh figs will be so large as to repay the growers. The price in this country, even in the natural season, is so high that there would be an immense margin for profit if they were offered here in December. In early winter Cape strawberries and apricots are, in season together, the former being in perfection in November, while the latter last all through December. It is maintained that these Cape apricots are, without exception, the best in the world. We have tried them both fresh, as delivered here, and preserved, and this experience, limited necessarily to a few cases, entirely bears out the claim made for the fruit. It is incomparable. Loquats in October and Cape gooseberries, a wild variety, which in

the form of preserves is almost the best *constitute* in the world, make up the list of the best Cape fruits, and we have no hesitation in saying that these, when properly cultivated and of good varieties, are some 25 per cent. better than any other, except certain varieties grown in England and Western Europe under glass. It is worth remembering also that in addition to the happy accident of the Cape autumn occurring at a season which enables its fruits to be sent here in winter and early spring, there are differences of season in the colony itself. The first plateau, which runs all round the coast, produces its crop at an interval from that on the second plateau, while the roasting heat and drought of the western province cause a different season for the crop from that in which the table grapes ripen in the east, where there are rains in November and February.

Nor are the Cape growers handicapped, as are those in the West Indies, by want of adequate steam service or easily reached markets. The huge increment of wealth in the goldfields has caused passenger lines to increase their steamers in number, size, and accommodation. These steamers, meant to carry those enriched by the goldfields, or those who in hope of being rich are careless of expenditure, are the ideal vessels for fruit transport—speedy, roomy, and furnished with ample cold storage. Yet Cape fruit, except the little black grapes, is very dear. It is still a costly luxury, not a popular delicacy. The Japanese plums grown in South Africa were, in May, selling at 1s. apiece in Covent Garden, Cape peaches were 1s. 6d. each, and pears 8d. The quality of all three kinds was perfect, but they could only be regarded as specimen fruit. While the crop remains dear and uncertain, it is not strange that little Cape fruit is yet imported, compared with the demand. The blame lies entirely at the doors of the growers themselves. Their Government is endeavouring to awaken Afrikaner opinion on the subject. They need teaching that only the best fruit is wanted here; that this must be carefully sorted, beautifully packed, so that in the package the fruit looks like a piece of decoration, or, at least, as fresh as when plucked; and that *then* the English public will pay a good price for it. At present the farmers are mostly too ignorant and indolent to do this. The fruit, as the Government Botanist complains, is thrown into kerosene tins or any chance receptacle, and sent off to be hawked about the local towns instead of being properly graded and sold in Europe and America. They should be taught the methods of California. Unlike the Cape, California has no near markets, as at Cape Town and Johannesburg. The shortest journey is to Chicago, 2,500 miles by rail, which costs £10 for every ton of fruit. New York is 3,500 miles distant, yet tens of thousands of tons are sent by rail to each city. They also ship their fruit another 3,000 miles by sea from New York to England, making 6,500 miles in all; and they make this pay, though their season is the same as our own. If California had the season of the Cape, and could get its peach and grape crops into our market in the winter and spring, it would double its industry. But the organisation of the Californian growers is perfect. The Fruit Growers' Union, in "acre shares," so that the smallest and the largest owners are members, collects the fruit, despatches it, and finds a market. The Cape growers have only to study the Californian system of business and modern modes of culture, and Nature will complete an industry as valuable as the goldfields and more lasting.

EARLY STRAWBERRIES.

We have been shown and have tasted some strawberries which were grown at Mooloolah by Mr. C. Court from seed imported by him from Mr. Root, the most celebrated strawberry-grower in America. The fruit in question was forwarded to Mr. A. H. Benson, Government Fruit Expert, who furnishes the following particulars about the berries:—

The fruit is of beautiful shape, one variety being large and broad, the other of most symmetrical conical form. The flavour is in marked contrast to that

of the Marguerite, more approaching that of strawberries grown in Europe and in the States. It would appear that this variety is likely to prove of much value to strawberry-growers, as it fruits earlier than any other, has a firm flesh, which is a most important quality from an exporter's point of view, and enjoys freedom from disease, another most valuable quality. It promises to be a first-class shipper, and, if so, should prove a great acquisition to the strawberry-growers in this colony. Its early fruiting qualities will, it is said, anticipate the southern strawberry season by some weeks, and hence our growers would obtain a high price for the fruit in Sydney. At present such strawberries would be worth in that market from 4s. to 5s. a quart. Mr. Court sent two quarts to Sydney on the 5th June, and further two quarts on the 8th. The strawberry season on the North Coast line does not begin till the end of July or beginning of August; thus this particular variety is quite two months earlier. Mr. Court is a professional horticulturist from Kent, and he intends to extend the cultivation of the strawberry as soon as possible. At present he has only a small patch growing.

Viticulture.

A DESCRIPTION OF SOME VINES GROWN AT THE STATE FARMS.

By E. H. RAINFORD,
Viticultural Expert.

No. 3.—THE HENAB-TURKI.

VIGOROUS grower.

Leaf.—Small, five-lobed, not deeply indented, without down below; petiolar sinus closed, teeth medium blunt.

Bunch.—Very large, loose and ramified; stalk long and thick.

Berry.—Very large, elliptical; very firm thick skin, deep rose in colour; sweet and agreeable.

REMARKS.

The Henab-Turki is either of Turkish or Egyptian origin, and is but little known and cultivated in Europe. Nevertheless, it is one of the handsomest grapes in existence, and possesses some first-rate qualities, which recommend it as a commercial grape. The large size of the bunch and berry, and its deep rose colour, combine to make it a very attractive grape. The writer trained a single vine of this variety on an overhead trellis in Southern Italy, and it yearly produced from 100 to 150 fine bunches. Its one defect is a propensity to non-setting the fruit, which can be remedied to a certain extent by pinching and sulphuring at flowering time.

This grape can be cultivated either on low trellis or overhead trellis, and can be pruned either on the spur or long-rod system—the latter being, perhaps, better suited. In pruning on the long-rod system, care must be taken to grow long canes for next year's fruit.

This grape ripens later than the Sweetwaters. It is fairly resistant to cryptogamic diseases.



VINEYARD NOTES.

By E. H. RAINFORD,
Viticultural Expert.

As soon as possible after the vines are pruned, the vineyard should be ploughed, and that to a sufficient depth if the ploughing is to be of any benefit to the vine. Deep cultivation of the vine is a point far too much neglected in this colony, our vigneron for the most part contenting themselves with superficial scarifying, apparently with the idea that so long as weeds are kept under it is sufficient. This is a mistake, for only the surface of the soil is kept in a fine state of tilth. A few inches down a hard pan is formed if the soil is at all so heavy that even a fork will penetrate with difficulty. No fruit tree is more susceptible to stagnant moisture than the vine, and a certain amount of oidium and black spot is attributable to this cause. Besides breaking up the under soil hardened by the summer scarifying, and allowing free passage for rain water, deep ploughing brings it to the surface where, under the agency of the air and the sun, the mineral matter in the soil is decomposed and rendered available for plant food. The first ploughing after pruning should throw the soil away from the vines, so that air may get to the roots, and should reach a depth of not less than from 6 to 8 inches. The second spring ploughing should throw the soil back again. But vigneron who have neglected deep cultivation of their vines hitherto are cautioned against beginning it when their vines are some years old. The effect would be to break off all the roots that have formed a few inches below the surface, and to considerably damage the vines. In these cases, the best thing is to run one or two deep furrows down the centre of the space between the vines where the roots are fewer and smaller, and damage to them would not affect the vine. But to those are just starting a vineyard, deep cultivation cannot be too much recommended. The roots will naturally seek the undisturbed soil, and these, by being deeper down, will not be so much affected by a sudden rise of temperature, which causes surface roots to circulate sap and prolong autumn vegetation.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

LICHENS.

THE following are determinations and descriptions by Dr. James Stirton, Glasgow, of the three small collections of lichens. No. 1, collected by C. J. Gwyther, at Jimbour (June, 1895); Nos. 2 and 3, by myself, at Thursday Island (June, 1897) and New Guinea (May, 1898) respectively:—

Calicium subtile, Ach. On decorticated *Eucalyptus*. Unfortunately, with two exceptions, all the capitula had elapsed or been broken off. The spores in the capitulum examined were mostly immature and colourless, and still retained in single file in the thecae. A few fuscous free spores were seen, elliptical, unilocular, $0.06 - 0.09 \times 0.04 - 0.055$ mm. And so far they differ in shape from those of *C. subtile*, which are oblong, &c. I cannot however, meanwhile at least, reconcile myself to the separation of the two. Curiously enough, this is the only specimen of this tribe of lichens that I have received from Australia or New Zealand, and, so far as recorded, the only other one is *C. curtum*, Borr., from New Zealand, given by Babington. The latter has much larger-septate spores.

Usnea hirta, *Fr.*

Usnea elegans, *Strn.*

Parmelia revoluta, *Flk.*

Parmelia caperatulata, *Nyl.*

Physcia chrysophthalma, var. *denudata*, *Hffm.*

Physcia sparsa, *Tayl.*

Physcia aipolia, *Ach.* By some lichenologists this lichen is merely reckoned a variety of *P. stellaris*. In *aipolia*, however, the white medulla is tinged a decided yellow by K; while in *P. stellaris* there is no visible reaction.

By K is meant liquor potasse, or, rather, a stronger solution—viz., a drachm of *potassa fusa* to an ounce of distilled water.

Physcia aipolia, var. *acrita*, *Ach.* Here the difference is mainly in the pale hypothallus as well as pale rhizine instead of black, as in *P. aipolia*.

Physcia confluens, *Fr.* I prefer to rank all the three specimens under *P. confluens* instead of *P. picta*, Sw., as the central part of the thallus is crustaceous in each. There is, as I have elsewhere stated, no distinct line of demarcation between the two lichens.

Pyxine subvelata, *Strn.* Trans. N.Z. Institute, 1897.

Pyxine rugulosa, *Strn.*, ut supra.

Pyxine subcinerea, *Strn.*, ut supra.

Lecanora aurantiaca, *Lightf.*

Lecanora rutescens, *Strn.* Similar to *L. albella*, but with smaller apothecia and the margins thicker, and when broken down rubescent or carneous. Spores colourless, simple, ellipsoid or broadly ellipsoid, $0.08-0.11 \times 0.06-0.08$ mm.; paraphyses few, medium, not easily separated, specked with lutescent or citrine granules, slightly club-shaped; hypothecium colourless. Hymenium with iodine intensely blue. On bark. Thallus and margin of apothecia with K, yellowish, then intensely red.

Lecanora parella, *L.*

Lecanora subfusca, var. *chlarotera*, *Nyl.*

Lecanora alligata, *Strn.* Thallus obscure or sordid; thickish rimose-diffract; apothecia sessile crowded, small, to 3 mm., lutescent, flat, margin whitish, obtuse, margin entire or crenulate, spores 8, colourless, ellipsoid, simple, epipore duplex, $0.11-0.13 \times 0.06-0.07$ mm.; paraphyses slender, slightly club-shaped, not sprinkled; hypothecium colourless. Hymenium with iodine intensely blue. On bark. Allied very closely to *L. ochrælla*, *Nyl.*

Lecanora phæantha, *Nyl.* Syn. Lich., N. Caled., p. 24. There are differences, such as the apothecia in the Queensland plant being at first ochraceous, then fusco-rufous and, at times, conglomerate. There is also a dense stratum beneath the hymenium, composed of fine, irregular, rather indistinct staffs. As Dr. Nylander makes no mention of this stratum in his description of the New Caledonian lichen, it might be as well, meanwhile, to distinguish the Queensland lichen by the name, *L. phæanthella*.

Lecanora punicea, var. *Babingtonii*, *Mass.*

Lecanora punicea, var. *collata*, *Strn.* Apothecia innate.

Lecanora punicea, var. *infusea*, *Strn.* Similar to *L. punicea*, var. *Babingtonii*, but the apothecia are reddish-brown, with whitish crenulate margins, and with thallus minutely whitish-granulose. Paraphyses not separable, with almost colourless apices, but slightly club-shaped (K-); hypothecium colourless. In other matters resembling *L. punicea*, var. *Babingtonii*. On bark.

Pertusaria leioplaca, var. *minor*, *Schaer.*

Lecidea (*Buellia*) *disciformis*, *Fr.*

Lecidea (Buellia) subrepleta, *Strn.* Thallus pallid, thin, fractured into small tile-like plates (K- C-); apothecia sessile, black, mediocre, flat, at first marginate, then convex and immarginate; spores 2-, 4-, 6-, usually 4, brown, ellipsoid, or obtuse-fusiform, 1-septate, $\cdot 03 - \cdot 04 \times \cdot 011 - \cdot 014$ mm.; paraphyses slender, distinct, filiform, irregular, branched, towards the apex, brown, and club-shaped; hypothecia thick, brownish-black. Hymenium with iodine slightly cærulescent; thecæ brownish. On bark.

The thick mass of the hypothecium, or rather perithecium, is very apt to separate from the hymenium proper and leave a thin fuscous, at times nearly colourless, hypothetical layer. This lichen is evidently allied to *L. parastata*, Nyl., Lich. Nov. Caled., but the spores are larger, only 4, for much the greater part, instead of 8 in thecæ, and the paraphyses are filiform and branching, &c.

There is another *Lecidea* which has several characters very nearly identical with those of the preceding, but which has peculiarities such as to entitle it to a specific place. The following description has reference to another specimen by the late Mrs. Heywood McEwen, who gathered it, in 1892, in a locality about 60 miles westward of Brisbane.

Lecidea (Buellia) subconnexa, *Strn.* Thallus whitish or pallid, thin, minutely fractured in tile-like plates (K yellowish); apothecia black, at first innate, and indeed often thalline-clothed, at length superficial and obtusely margined, finally somewhat convex; spores 8 in saccate thecæ, brown, ellipsoid, with a single locus at each pole, $\cdot 02 - \cdot 027 \times \cdot 01 - \cdot 013$ mm.; paraphyses slender, distinct, apices black and clavate; hypothecium slightly fuscous or almost colourless. Hymenium with iodine lightly cærulescent, at length vinose-fulvescent, especially the thecæ. On bark.

I have never seen any lichen having such curiously shaped yet sharply defined nuclei. The sharp delineations are blurred by age.

Another *Buellia* under this division was lately picked out of No. 86 of a former collection by Mr. Bailey, the internal organisation of whose spores is nearly identical with the second, but more especially with the third figure as given above.

Lecidea (Buellia) restituta, *Strn.* Thallus whitish or pallid, minutely and conversely areolate (K yellowish); apothecia innate, at first clothed by the thallus, finally black, flat or somewhat convex, faintly margined, mediocre; spores 8, brown, ellipsoid or oblong-ellipsoid, often slightly curved and polar-bilocular with short tubules, 1-septate, nucleate, $\cdot 024 - \cdot 034 \times \cdot 009 - \cdot 012$ mm.; paraphyses slender, fairly separable, apices black and clavate; hypothecium blackish-brown. Hymenium with iodine intensely cærulescent. On bark.

There is certainly a close connection between the three preceding lichens, but, as the differences indicated are constant, it is as well to state them openly and leave to future investigations the task of showing whether such distinctions have physiological significance of sufficient importance to warrant them being retained as distinct species or the reverse.

Pyxine obscurior, *Strn.*, described in the Proceedings of the Royal Society of Victoria, 1881, has a peculiar hypothallus. It is smooth, even glistening in places, of a pale fulvescent colour, and with few or no rhizinae. This hypothallus is not firmly adherent to the bark, and the whole thallus may be easily stripped off it. All this inclines me still to rank it under the genus *Pyxine*. The reactions of the white medulla by K—viz., yellow, then a deep red—are, however, so unique in this genus that there has lately arisen a doubt. After making this statement, I must leave the determination of its generic place in abeyance at present. The only other possibility is association with the *Buellia*, which we have just had under consideration.

Arthonia subcondita, *Strn.* Thallus whitish or pallid, thin; apothecia black, punctiform or maculiform, minute, rotund or somewhat irregular, flat, spores 8, in saccate thecæ colourless, obovate, $7 - 11$ locular, $027 - 035 \times 011 - 014$ mm.; paraphyses seldom visible; hypothecium colourless. Thecæ with iodine vinose-violaceous, while the spores take a lutescent tint. On bark.

Verrucaria coarctata, *Strn.* Thallus indicated by whitish spots; apothecia black, slightly prominent, nude, minute, width to about .3 mm., perithecium nearly spherical, incurved and colourless beneath; spores 8, in saccate thecae, colourless, ellipsoid, divided into numerous and brick-like cellules, $6 - 9 \times 2 - 5$ locular, $.027 - .035 \times .013 - .018$ mm.; paraphyses long, distinct, filiform. Hymenium not coloured with iodine, lutescent; with the same reagent, the thecae become vinose fulvescent. On bark.

Arthonia conspersula, *Strn.* Thallus pallid, thin; apothecia black, flat or rather convex, to about .5 mm., rotund or somewhat irregular, within colourless or ashy pale; spores 2-4, colourless, oblong-ellipsoid, 3-septate or rather 4-locular, $.036 \times .011 - .014$ mm. Hymenium with iodine, wine-red. Thecae broad, ellipsoid, walls thick and hyaline. Spores when young often simple. On bark.

As I possess only other two apothecia, I do not care meanwhile to corroborate my diagnosis by destroying another.

Trypethelium exiguum, *Strn.* Thallus indicated by thin, whitish or somewhat bluish spots; apothecia black, 2-6, crowded, at first thalline clothed, then nude, small; spores 4, occasionally 2, and rarely 1, colourless, ellipsoid or oblong-ellipsoid, murally divided $(4 - 7) \times (1 - 3) -$ locular, $.022 - .028 \times .008 - .01$ mm., paraphyses filiform, distinct, irregular, branched. The thick hyaline walls of the thecae and their contents with iodine become wine-red. On bark.

Parmelia ablata, *Strn.* As the specimen from this region is not in good condition, inasmuch as not any spores have been detected in the thecae, I shall not give a description of it here, but shall do so in a paper on lichens from the neighbourhood of Warwick, Queensland, where this *Parmelia* was also secured.

Physcia crispa, *Pers.*

Physcia crispa, var. *Ravenelii*, *Tuck.* Tuckerman considers this a good species. In this collection of lichens there are also traces, in the shape of a few barren stems, of another *Physcia*, which has a striking resemblance to one secured by Mr. Hugh Paton in 1875 at Riverina, New South Wales. As I have very little doubt of the identity of the two, I shall give a diagnosis of Mr. Paton's lichen.

Physcia excelsior, *Strn.* Thallus orbicular, to 1-2 in. wide, reddish or cinnabar-coloured, beneath concolorous or paler, with long linear-laciniate (K. purpuracent) prostrate segments, flat or rather convex, width about .6 m.m.; dichotomous or towards the apex many times divided and ascendant, on all sides lengthily and very densely fibrillose; apothecia concolorous, rather prominent, marginate, the margins often paler and somewhat spinulose below; spores 8, colourless, oblong or rarely ellipsoid, polari-bilocular, the tubules very shortly or not at all joined, $.013 - .017 \times .006 - .008$ mm.; paraphyses distinct, with citrine apices, sprinkled with granules. Hymenium with iodine intensely caeruleous. On bark.

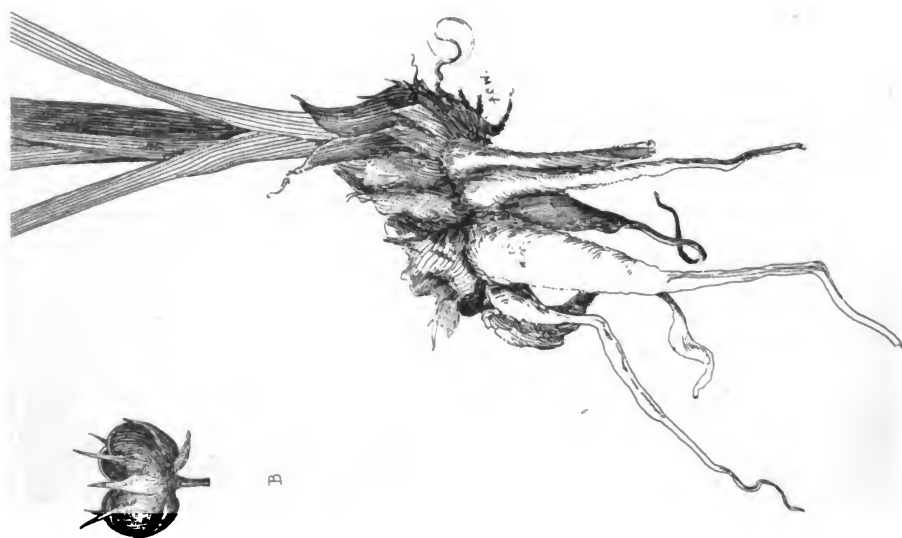
This is evidently quite distinct from any of the many forms of *P. chrysophthalma*.

Pannaria pannosa, var. *accolens*, *Strn.* Similar to *P. pannosa*, Sw.; but the thallus more lead-coloured, and the mature spores brownish. Spores 8, simple, ellipsoid, epispore duplex, $.014 - .018 \times .007 - .01$ mm.; paraphyses scarcely separable, with brownish clavate apices; hypothecium colourless. On bark.

Tuckerman, in his North American Lichens, vol. i., p. 119 (1882), says of the spores of *P. pannosa* that they are commonly brown. As I have never seen the spores so coloured except in this instance from Queensland, I have considered it preferable to constitute a variety of the lichen with such spores.

The radicles beneath are not in such a dense felt-like mass as in *P. pannosa*, nor are the fibrillae disposed in parallel ridges. Corticola.

Pannaria molybdæa, *Ach.*



BLOOD-ROOT (*Hamodorum coccineum*).

Pannaria ciliolata, *Mnt.*; *sterilis*. The epithallus is composed of rows of small quadrangular cells, sharply defined. *Gonimia* cærulescent, rather large, .006 — .01 mm. broad. Thallus beneath with pale radicles in bundles. As the specimen is barren, I do not care to separate it from Montague's plant; besides I possess merely a scrap of the latter in a miserable condition.

Lecidea subcærulea, *Strn.* Thallus thin, continuous, pallid or pale greenish; apothecia brown, .4 — .8 mm, girdled with a rather prominent, whitish, entire margin; spore solitary, colourless, oblong, divided into brick-like cellules, .06 — .09 × .012 — .018 mm; paraphyses distinct, filiform, slender, few, branched towards the apex, which is faintly coloured and a little club-shaped; hypothecium a sordid blue, finally fulvescent, subtended by a bluish continuous stratum. The hypothecium has a bluish (not purplish) tint in younger apothecia, which changes to a dirty greenish colour, and this ultimately becomes fulvescent. The continuous blue stratum beneath the hypothecium is also peculiar. Hymenium, especially the thecæ, cærulescent with iodine, the paraphyses scarcely tinted, while the spores (under the same reagent) are flavescent. On bark.

Arthonia varia, *Ach.* Lignicola.

CONTRIBUTION TO THE FLORA OF NEW GUINEA.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order ORCHIDÆ.

ORNITHOCHILUS, Wall.

O. Moretoni, n.sp. (After Hon. M. H. Moreton.) Stems short, solitary, or slightly clustered. Leaves distichous, thick, recurved, usually channelled above, obtuse and unequally-emarginate, 2 to 3 in. long and about 1 in. broad, pale. Racemes lateral, peduncle with rhachis about $1\frac{1}{2}$ in. long, stout; flowers deep-yellow, scattered, small, on short pedicels. Bracts about 1 line long, triangular with elongated points. Flower-bud globose, $1\frac{1}{2}$ lines diameter; spur spreading prominent on the bud, about $1\frac{1}{2}$ lines long; pedicels 2 lines long. Sepals oblong, thick, about $1\frac{1}{2}$ lines long. Petals scarcely exceeding 1 line, almost rotund. Labellum sessile, 3-lobed, lateral ones broad and erect, embracing the column, their upper margins thin and whitish; terminal lobe yellow, thick, saccate. Column very short, broadly winged. Anther-lid beaked. Pollen-masses 2, globose, amber-coloured.

Hab. : On the trunk and branches of trees, Samarai, New Guinea. Described from a plant now flowering in Lord Lamington's plant-house. Under more favourable conditions, it is likely the flowers might be larger than above stated.

PLANTS REPUTED POISONOUS TO STOCK.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

SCARLET BLOOD ROOT (*HÆMODORUM COCCINEUM*, R.Br.)

HÆMODORUM is the typical genus of the order *Hæmodoraceæ*; it contains about 17 species, 4 of which are met with in Queensland, usually on damp somewhat swampy land; the leaves are mostly flat, long, and narrow, arising from a more or less thick, reddish-brown or nearly black, short underground stem; the flowering stems are more or less branched. The flowers are black, red, or greenish. The species under notice is the most showy of all; its flowers are numerous, in compact, terminal, corymbose panicles, upon more or less branching

stems, from 1 to 2 feet high; flowers deep red or crimson; segments 6 about 3 lines long; stamens 3, shorter or longer than the segments; anther much shorter than the filaments. Capsule $\frac{1}{4}$ to near $\frac{1}{2}$ inch broad, 3 or sometimes 2 celled. Seeds flat.

The last person from whom I have received specimens of this plant, as a suspected poison, is Mr. R. Sturt, secretary of the Cairns Chamber of Commerce. He says: "The plant has proved itself very injurious to horses. It grows about the ridges on the Mulgrave; and a horse that was fed with it, for experimental purposes, died. In mild cases the horses get griped, and it has only recently been traced to this plant." Plants of the order are not known to possess what might be termed poisonous properties; they are known, however, to be intensely bitter.

On the islands of Moreton Bay one species—viz., *H. tenuifolium*, A. Cunn.—is in places abundant. Can the loss of stock in that locality, of which we hear sometimes, be traced to this plant?

Sixty years ago Mr. James Drummond, then a botanical collector at Fremantle, Swan River, in "Botanical Information" published in Hook. Journ. of Bot. ii. 355, says that the roots of several species of *Hæmodorum* furnish one of the principal vegetable foods of the natives of that colony. He remarks further, also, that the roots of all the species are mild and nutritious when roasted, but acrid when raw.

A rich dye prevails in the root-stock of all the species.

Popular Botany.

OUR BOTANIC GARDENS.

No. 10.

By PHILIP MAC MAHON,
Curator.

How do you prune roses? is a question often asked by visitors to our Gardens; and as the rose is such a universal favourite, and the time for dealing with it in pruning, propagating, and other directions, is now at hand, we may have a little chat as to its varieties, propagation, culture, pruning, &c.

The rose is a comparatively newcomer into the domain of Flora in Great Britain. The Moss Rose was known in England over 300 years ago; and about 3 centuries ago the Provence Rose, which you, who have lived in England, remember as the old cabbage rose which bloomed so freely in the homely cottage gardens, was introduced to Great Britain.

The rose mentioned in the beautiful Song of Solomon, and again in the Isaiah xxxv. i., was not what we call the rose, but a bulbous plant, the *Narcissus tazetta*; but all over the East the rose is now cultivated extensively, not only for its beauty, but for the costly perfume, attar of roses. There are in the East many wild species of the real rose, and in Indian and Zend poetry the word frequently occurs. What is known as the Rose of Jericho is, however, not a rose, but a plant belonging to the same natural family as the cabbage, rejoicing in the formidable name of *Anastatica hierochuntica* and which possesses the remarkable property of curling up in a ball when it becomes very dry; in this condition being blown about by the wind, and reviving when it comes to water, or when sufficient rain falls to supply its needs. You may remember having numbers of this plant offered to you for sale as you passed through Port Said on your journeys to or from Europe.

Attar of roses is obtained from the flowers of *Rosa centifolia provincialis*. It is obtained by simple distillation by the Christian inhabitants (chiefly) of the Balkan States in Turkey in Europe, in Turkey in Asia, and in Bulgaria. The process is simple, and the writer will be glad to describe it to anyone who thinks of giving the matter a practical trial, as the industry is eminently suited to the conditions which prevail in Queensland.

The following extract is from the splendid book by Mr. G. W. S. Piesse, the celebrated perfumer of London, called "The Art of Perfumery," published by Longmans and Co. :—

"The following is a summary of the production of otto (attar) in Roumelia previous to the Russia-Turkish war of 1877-78 :—

| | | | | | |
|--------------|-----|-----|-----|--------|-----|
| Kezanlik | ... | ... | ... | 27,776 | oz. |
| Guenpsa | ... | ... | ... | 12,064 | " |
| Karaja-Bogh | ... | ... | ... | 6,144 | " |
| Tchirpan | ... | ... | ... | 2,592 | " |
| Koyoun-Tepe | ... | ... | ... | 1,888 | " |
| Pazardzik | ... | ... | ... | 1,760 | " |
| Yeni-Zaaghra | ... | ... | ... | 1,728 | " |
| Zaaghra | ... | ... | ... | 1,568 | " |

55,520 oz.

This estimate is based on the average production of the last ten years, but in 1866 it reached 96,000 oz., and in 1872 fell to 27,000 oz. As to the commercial value of the otto (attar), it may be fairly estimated, when pure, at from 25s. to 30s. per oz. In round numbers we may therefore say that the rose farms of Roumelia are worth £70,000 to £80,000 per annum. That rose and other farms (for perfumes) can be established in Fiji, Queensland, and at Swan River, I have little doubt; and to landowners there I commend the figures recorded."

In Cashmere the rose is also largely and profitably cultivated for the attar; the cultivation is carried out by the parents of the family, the work of the children being to collect the roses for distillation. In this charming valley, where the attar of roses is superior to that produced in any other part of the world, it is found that from 600 to 700 lb. of the leaves are required to produce 1 oz. of attar. England is also in the field in the growth of roses for perfumery purposes, numbers of people near Mitcham, in Surrey, earning a good livelihood by their cultivation, and during the season sacks full of roses are regularly sent to London, where the perfumers pickle them with salt, which enables them to be kept for any length of time. They are then employed in the manufacture of rose-water, a quite simple process. There is no reason why pickled roses should not become an object of export from this colony, as it is found that those from the South of France are much superior to the English ones for the manufacture of rose-water. A pound of rose petals makes about 1 lb. of rose-water.

The rose may be traced from very humble beginnings, until we find it the thing of beauty which makes lovely our gardens, and is so beloved by rich and poor that a distinct blank would be left in our lives if it were removed. As the varied races of mankind may be traced from the cave-dwelling Iberian, through successive ages of improvement and increasing culture, to the refined Parisian, so can we follow the rose. And here we must ask, before we answer the question, "How do you prune roses?" "What kind of a rose do you mean?" Because there are roses and roses, and, especially in the matter of pruning, what will be good for one may be very bad for another. And even in the same general class, there are certain roses which seem to have caught a strain of some peculiarity from a remote ancestor, which makes it differ from its fellows of the same class, and its physique and peculiarities have to be taken into account if you would succeed with it.

It was calculated in 1893 that up to that time about 6,400 different varieties of roses of some degree of merit had been produced by the horticultural trade so that the man "who knows every rose you show him" must needs have a lon

memory. The number has greatly increased since then. All these beautiful and varied flowers have been derived by cross-fertilisation from a few species—that is to say, kinds which are found constantly distinct in a state of nature; though roses, like orchids, are frequently cross-fertilised in their natural habitats. Of these species there are about 60, and some are well known as old-time garden plants. They are found wild in widely separated lands, but almost entirely in Abyssinia, Europe, the Orient, China, North America, Britain (some forms being peculiar to those islands), Siberia, Afghanistan, California, India, Kamtschatka, Persia, and Japan.

Eight of these species have an interest for us as being the ancestors of all our splendid garden varieties of to-day, and these we may glance at very briefly. *Rosa centifolia*, the hundred-leaved rose, was brought from the Orient in 1596. The Moss Rose (*Rosa centifolia muscosa*) is a variety of this. The hundred-leaved rose is the parent of many of our most beautiful roses. The common cabbage rose was one of its forms. *Rosa damascena* (the Damask Rose) was brought from the Orient in 1575. *Rosa gallica* (the French Rose) is a native of Europe and Western Asia, and has given rise, as we shall see, to several grand varieties. *Rosa indica* is the common monthly rose, and is believed to be one of the parents of the beautiful old rose, *Rosa Fortuneana*. *Rosa lutea* (the Austrian Briar) has come much to the front of late. It is a native of the Orient. *Rosa moschata* is the Musk Rose, and a probable parent of the Noisette roses. *Rosa rugosa* is a parent of the Japan roses.

Let us now glance at the varieties of the garden roses as they are classed by the gardener.

1. **THE PROVENCE ROSES.**—These are descended from *Rosa centifolia*. They mostly grow dwarfishly, and the knife can be used freely in pruning. They are all sweetly scented. They can best be propagated from cuttings, doing well on their own roots.

2. **THE MOSS ROSES.**—These do not succeed well in Queensland, but two or three of the most vigorous might be tried, such as Comtesse Murinais, Com-mom or damask, Laneii.

3. **DAMASK ROSES.**—The offspring of *Rosa damascena*, which came from the Levant in 1573. They look well planted amongst other roses, if only for the foliage, which is characteristic, being of a much lighter green than usual.

4. **HYBRID PERPETUALS.**—This well-known class originated in crosses between the Damask and French roses and other classes. They comprise some of the most beautiful of roses, some being of very dark hues. They are not found, however, in orange or yellow. They are delightfully scented, having a quality of perfume peculiarly their own, and not found amongst other roses. They are often grown to a great size, and the delightfully scented monsters which one so often sees at exhibitions are of this class.

5. **TEA SCENTED ROSES.**—This is the Queensland rose, *par excellence*. It owes its origin to *Rosa indica*, as does also the Noisette class, frequently separated in rose catalogues. They cannot, however, be distinguished in many instances, and the National Rose Society at present classes them with the tea-scented roses.

Some of the very best climbers are to be found amongst the Teas, as they are familiarly called, and amongst them are to be found a great number of roses possessing the substance of petal so desirable for a Queensland rose. They are usually divided into two sections—those of very vigorous growth with a climbing habit, and those of more moderate growth. Of the first section may be mentioned:—Belle Lyonaisse, Cheshunt Hybrid, Climbing Captain Christy, Climbing Devoniensis, Climbing Niphotos, Climbing Perle de Jardins, Fanny Stolwerck, Glorie de Dijon, Le Soleil, Madame Bérard, Madame Chauvry, Madame Eugène Verdier, Mai Fleuri, Maréchal Niel, Pink Rover, Reine Marie Henriette, Waltham Climber No. 1, Waltham Climber No. 2, White Maréchal Niel. The second section contains several favourite and beautiful varieties,

as:—Alba rosea, Amazone, Anna Oliver, Bridesmaid, Catherine Mermet, Cleopatra, Comtesse Riza du Parc, Corinna, Devoniensis, Ernetz Metz, Etenard de Jeanne d'Arc, Etoile de Lyon, Francisca Kruger, Francis Dubreuil, G. Nabonnand, Graziella, Homer, Hon. Edith Griffith, Madame Hoste, Madame Lambard, Marie van Houtte, Medea, Niphetos, Perle de Lyon, Perle des Jardins, President, Princess de Sagan, Safrano, Safrano à fleurs rouges, Souvenir de Paul Neyron, Souvenir de S. A. Prince, Souvenir de 'un Ami.

6. **HYBRID TEAS AND NOISETTES** came to be crossed with Hybrid Perpetuals, and the result of these and other crosses has been a race of roses known as Hybrid Teas. They occupy a kind of midway position. They should succeed very well with us. They flower with remarkable freedom. A few may be mentioned:—Augustine Guinoisseau, Camoens, Captain Christy, Caroline Testout, Clara Watson, Countess of Pembroke, Danmark, Kaiserin Augusta Victoria, La Fraicheur, La France, Lady Mary Fitzwilliam, Madame Jules Finger, Madame Pernet-Ducher, Marquise de Salisbury, Souvenir de President Carnot, The Meteor, White Lady.

7. **BOURBON ROSES**, including Chinese and their Hybrids, and Hybrids of Bourbons and Noisettes, such as: Acidale, A. Maille, Climbing Souvenir de Malmaison, Dr. Berthet, Lorna Doone, Mrs. Bosanquet, Mrs. Paul, Souvenir de Malmaison, &c.

8. **AUSTRIAN BRIARS**.—Strong growing, fragrant.

9. **SCOTCH AND SWEET BRIAR HYBRIDS**.—An English nobleman, Lord Penzance, has, within the last few years, produced a new and interesting race of roses by crossing the Scotch and Sweet Briars with other varieties. They still have the charming scent which renders the Sweet Briar such a favourite in England, but, in addition, these roses are beautiful in the colours of their flowers, which are produced in great profusion.

10. **AYRSHIRE ROSES**.—These are of the rambling type, and good for covering fences, &c., requiring chiefly to be let alone.

11. **JAPANESE ROSES**.—Single and semi-single roses, continuous flowering, but not of very brilliant appearance.

12. **POLYANTHA ROSES**.—A few charming roses are included in this type. They are small flowered, but the blooms are exceedingly neat. Crimson Rambler, Cecil Brunner, Etoile d'Or, Little Dot, Perle d'Or, Parquerette, and Souvenir d'Elise Chatelard are of this type.

CULTIVATION.

For roses you want a rich, well-drained, and somewhat heavy soil, and the rose requires that you liberally supply it with decaying substances in the shape of manure, well-decomposed stable or farmyard manure by preference. The ground should be trenched, or, if the drainage is already good, a very deep digging will suffice. You will find amongst the roses enumerated in the foregoing lists sufficient to give you a great variety, both of habit and colour. A great deal of disappointment frequently arises from the mistake of putting in a lot of mixed roses together under the belief that simply because they happen to be all roses they will look much alike in habit and appearance generally when they come to be established. As a matter of fact the general appearance turns out to be ragged in the extreme.

By going carefully through a good rose catalogue you can pick out a good selection if you go about it systematically. Write the name of each rose on a separate slip of paper. Under the name write if it is a climber, a dwarf, a bedding rose, &c. Under that write its colour, keeping those to a few prevailing hues. Under this you can write any remarks, and then you have simply to sort your slips out into any number of classes as regards v'gour, colour, adaptability for certain purposes, such as covering for arbours, bedding, pillars, &c.

The colours you will mainly find amongst roses will be :—White, blush and flesh of various shades ; yellow, pink, rose, light-crimson, dark-crimson, maroon and purple. We have said that Tea Roses do best here, and it may be that some readers would like to know the names of a few reliable Tea Scented roses of the above several shades of colour. Here they are :—

White, blush and flesh, more or less shading into each other.—Augustine Guinnoisseau, Captain Christy, Enchantress, Innocente Pirola, Madame Alfred Carrière, Madame Plantier, Souvenir de Malmaison, Souvenir de President Carnot, White Lady.

Yellow.—Anna Ollivier, Boquet d' Or, Celine Forestier, Madame Falcot, Marie van Houtte, Perle de Jardins, Persian Yellow, W. A. Richardson.

Pink.—The Bridesmaid, Catherine Mermet, La France, Maman Cochet, Pink Rover.

Rose Colour.—Camoens, Grand Duc A. de Luxembourg, Madame Lambard, Mrs. W. J. Grant.

Light-crimson.—Crimson Rambler, Déschamps, Marquise de Salisbury, Reine Olga de Wurtemberg, Waltham Climber No. 1.

Dark-crimson.—Bardou Job, Francis Dubreuil, Princesse de Sagan, Waltham Climber No. 3.

Maroon and Purple.—There are no Teas of these colours, but six good Hybrid Perpetuals are—Abel Carriere, Black Prince, Pierre Notting, Prince Camille de Rohan, Reynolds Hole, Sultan of Zanzibar.

You will note that Teas, Hybrid Teas, Bourbons, &c., are here classed together.

Now as to pruning. Quite a mistake is sometimes made here by pruning too early, and thus allowing the young shoots to get a good start during comparatively mild weather, only to be cut off by a late westerly or two. It is better to prune when the westerlies have gone for good if this can be managed. In most cases it will do less harm to cut off a few developed shoots, which may have started owing to somewhat late pruning, than to be in the position of the man who pruned his roses hard back early in May, and has no reserve wood to cut them back to after they have been through the recent severe westerly winds. The vigour and shape of your rose will be a good guide to you in the matter of pruning. Suppose you have to deal with a bush which has been neglected or unskilfully pruned. Examine it carefully, and decide what old useless wood you can cut out. Get a small key-hole saw, and carefully remove the old wood, leaving the young, vigorous shoots. Smooth over the cuts with a sharp knife. Do not use a secateur in pruning roses. It is a lazy man's implement, and bruises the wood. Having cut out the old and used-up wood, prune out the weak wood, and then, according to the strength and habit of your rose, cut back the other wood. There is no rule which will apply to this like the solution of a mathematical problem, for, as has been said before, roses nearly related require quite different treatment with the knife. You may often see roses pruned just as if the knife-wielder felt like little George Washington, that, having got an edged instrument in his hand, he must go out and cut something. Roses should be pruned more or less all the year. You will note that a branch of one of your strong-growing roses will produce a quantity of bloom and then cease to bear any more. Well, the sooner you get rid of that branch the better ; for it will never bloom again. It will produce along its length a number of weak branches if you let it remain, and these may produce some indifferent flowers ; but if you cut it back, you will get from the base a good strong shoot, which you can train on in place of the old one, although it may happen that you want to get a quantity of wood to form a covering for a wall or trellis ; then you will shorten back your strong old growths, and, when new ones start, you will rub out those you do not want while they are still quite young. As a general rule, weak roses require to be cut back closer than very vigorous ones. Hybrid Perpetuals should have the shoots which arise from the base first thinned

out, leaving only a few proportionately to the strength of the plant, and then the shoots left should be shortened back; the weaker the plant, the lower it may be pruned. In this, and in all pruning, cut to an outside bud. You have seen scores of persons, when pruning, measure with the eye the height at which they propose to make a cut, and then take off the shoot, quite oblivious of the fact that the top bud, which will, of course, be the most vigorous, will grow right into the middle of the bush, spoiling its shape, cutting off the supply of light and air, and preventing the flowers and fruit from attaining their highest development. If you look at any shoot as it grows on a tree, you will see that the buds point in different directions—some outwards, some inwards, and some sideways. Now, it will be very clear to you that, if you cut back that shoot to a bud which points inwards, that bud, when it begins to grow, will grow inwards—to the damage of the tree. So always take care to cut back to an outside bud.

Roses are propagated in several ways, any one of which would require a paper to itself. Cuttings are put in for two purposes—to produce a rose of the same variety as it has been cut from, and to produce a stock upon which another rose is to be budded.

For cuttings of the former type, get firm pieces of the wood of the present year—that is to say, wood formed last summer. Make your cuttings 6 or 8 inches long; insert them in a free, sandy compost to a depth of about three-fourths of their entire length. In the growing season you can strike cuttings of young wood of the Teas and Noisettes if you take off a “heel” of the old wood with the cutting, and put the latter in sandy soil, covering with a bell-glass, or some such contrivance, until the leaves, which must be left on, recover, when the cutting will soon emit roots.

Apiculture.

By W. TOFT, Oakwood Apiary.

I NOTE with pleasure the nine pages devoted to Apiculture in the May issue of the *Queensland Agricultural Journal*, and venture a few remarks, hoping that other beemen will take the matter up and do likewise; and thereby push Queensland beekeeping ahead.

Weight of Honey per Hive.—The average of 94 lb. per hive seems to me rather low, but when all things are considered—viz., beginners, queen-rearing, wax production, &c.—the average is fair; but by careful manipulation and working *with your bees*, from 200 to 300 lb. per hive can be obtained in good seasons.

Swarming.—When I find a hive showing symptoms of swarming fever, I take all their brood away, and fill up the hive with empty combs or frames filled with foundation, giving the brood to any weak hive that may require a little help.

This is the best medicine I can find for the swarming fever, and if taken in time it is very effective.

Bees not Taking to Supers.—If I find a stock slow in taking to supers, I at first make sure that the top and bottom bars of each super are properly spaced. I then take three or four frames of brood, of all ages, place it in supers, and fill up with empty combs; and usually all goes well.

Two Queens in Hive.—About 9 years ago I had experience of two queens in one hive, both laying and working well together, but one was an old queen. Before number 2 queen arrived, I looked through the hive at least once a

week, and for about 5 weeks I regularly found just one royal cell with larva in it, which I always cut out. I missed one week's overhauling, and then found a single cell, which a queen had just left. The following week I found her laying, and, to my surprise, the old queen was on the same frame, and laying also. This went on for some weeks, and the old queen died during winter.

Grading and Ripening Honey.—This, in my opinion, is the all-important question to be considered if Queensland honey is to get hold of the home market. If anything but the best, ripe, thoroughly-matured honey is sent to England, the returns will be disappointing, and Queensland honey will be generally shunned.

The sooner Queensland beekeepers take this matter in hand, and face this question of marketing their honey, the better for us all.

This can best be done by forming associations and discussing matters appertaining to bee culture. Steps can then be taken unitedly to ship tons of honey to England after it has been graded by experts.

You say, "Let our producers study the style of get-up, and not send honey home in kerosene tins." This looks and sounds very well, and is very true also, as there is no better way of selling good honey readily than to pack it in glass and in other attractive packages.

But the price of these articles prohibits us from using them, to say nothing of the extra freight; therefore, the only course I can see open to Queensland bee-men is to combine, appoint a board of experts, and send a thoroughly trustworthy and competent man home to procure these attractive glass vessels, where they are so cheap, and to ship the honey to him in bulk, and allow him to do the rest. The extra freight and breakages saved would go a long way towards paying expenses, to say nothing of the better price which would be obtained.

It would be a great help to beekeepers if the Postal Department would allow samples of honey to go through the post if properly packed. In writing the above notes, my object is to set the ball rolling, in the hope that others will take it up also.

Horticulture.

PANSIES.

PANSIES, or as they used to be called "Heartsease," may be seen in most tidy gardens in Southern Queensland, and one reason for this is that the pretty little flower is so easily grown, and that it produces such a number of blooms at so little expenditure of labour or care. The best way to raise pansies is to sow the seed in shallow boxes in the same manner as most seeds are raised in the Brisbane Botanic Gardens, where galvanised iron cases (that is, the wooden cases in which the iron has been packed) are employed for the purpose. The amateur's box need, of course, not be so large. The box must be filled with a light sandy, loamy soil—a good light garden soil will do very well. Make the surface perfectly smooth, and scatter the seeds evenly on it. They must not be either raked in or covered deeply. The best plan is to sift some light soil over them, covering them to the depth of less than a quarter of an inch. This done, give a very gentle sprinkling of water, and set the box in a sheltered situation. In about a week or ten days the little shoots will appear above ground. When watering is required, it must be done very gently from a fine-holed watering pot. When the plants are from 2 to 3 inches high, they may be set out. Always, if possible, choose a dull, cloudy day for setting out any plants. The permanent bed must be deeply dug, and the soil rendered mellow. Set the plants out about 8 inches apart both ways. In less than a couple of months they will be in flower, and will continue in bloom until the next autumn. The soil must

be regularly worked, and plenty of moisture should be supplied. It is a good plan to give a little liquid manure to help them along. All blossoms should be picked off regularly to prevent the formation of seed-pods, which naturally weaken the plant. With very slight care, lovely little beds of pansies can be raised by even the children of the house, whether in town or country. All children love flowers, and every encouragement should be given them to engage in such a charming occupation as simple flower-gardening. Start them on pansies, sweet-peas, dianthus, crocuses, &c.—all of which require little trouble; and they will soon imbibe a taste for gardening, which will afford light and pleasing occupation for many a leisure morning and evening hour.

What should a good pansy look like? is often asked. The *Mayflower* says:—“Florists demand that a pansy to be perfect must have a round outline, flat and very smooth edge, petals thick and velvety, the three lower petals alike in their ground colour, the lines and markings in the centre bright and distinct, the two upper petals (which always differ in colour from the others except in solid colour sorts) perfectly uniform, and the flower to measure at least an inch and a-half in diameter.”

Tropical Industries.

THE SUGAR INDUSTRY IN THE NORTH.

By A. A. RAMSAY,
Government Sugar Experiment Station, Mackay.

THE cane crops in the North (the Herbert, Johnstone, and Cairns) are more or less backward this year, owing probably to the dry weather of the past year. On the Herbert, the cane is particularly so, and cane for seed is very scarce. Unfortunately, “rot” is prevalent in the cane there this year, and the cane in some localities has been more or less damaged by flood. The Halifax cane is better, though there “rot” is also present. Last season a large percentage of Lahina cane was grown by the farmers there. This occasioned considerable trouble in the mill, as the cane, though shredded, parted with its juice with difficulty, the shredded portions passing through the second mill, but not being torn up as was the case with other canes.

A cane, “Moore’s Purple,” introduced from New South Wales, does fairly well on the Herbert, though it has proved unsuitable for the climate of the Johnstone. In the latter place this cane sun-cracks badly, and soon deteriorates. This cane is very liable to be attacked by gumming. The area under cultivation is steadily increasing, though not with such rapid strides as on the Johnstone and at Cairns.

Though the weight per acre is not great on the Herbert (probably about 14 tons—17 tons on an average of all lands cultivated, though some individual farmers get nearly double that amount), the cane is sweet (about 14 to 14.5 per cent. cane sugar on an average), and in October often reaches 16.4 per cent., with 5 to 6 per cent. fruit sugar and quotient of 89-90, but the fibre in the cane reaches 11.5 per cent.

Of the varieties of cane cultivated in the North, Rapoe or Rose Bamboo is the principal one, though Striped Singapore is becoming a great favourite, and there is a large demand for this cane at present as seed. The total area under Meera is small. This remark also applies to Dupont cane, which is principally grown by farmers in the grub-infested portions of the Johnstone. The drawback to this cane is that it requires to be cut exactly when ripe, as both before and

after that time the sugar content is low; the advantage, on the other hand, is the large roots and flat stool, and consequent power to resist as much as possible the ravages of grubs. A variety of cane introduced by the late Mr. Cowley on his first trip to New Guinea, "Chinome," and called on the Johnstone "Yellow New Guinea," has been cultivated there for three or four years, and seems to give great satisfaction. As to the future to be played in the economy of the sugar industry by New Guinea canes of later importation (by H. Tryon), I would say that several varieties give great promise, notably No. 22 Mohona, which is said to contain over 17 per cent. cane sugar, and to have a quotient of purity of 93. Others—viz., 49 Green Barema, 5 Kiwari, 3 Barone, 15 Badila, and 2 Givi Givi—contain from 15 to 15.5 per cent. cane sugar, and have a quotient of about 87. No. 10 Yakarewa, 6 Gegon, 14 Hitan, 42 Goi Goi, and 7 Bongan are said to contain 12-13 per cent. cane sugar, and have a quotient of 82-86; while 20 Ball Dila and 24 Goru only contain 8 and 4 per cent., respectively, pure obtainable cane sugar. These figures refer to cane about 13 months old. From what slight information is available, it seems probable that these canes have a time of maximum sweetness, and that after that time the sugar content falls very rapidly indeed.

In the Cairns district, besides Rose Bamboo, a fairly large area of Lahina is growing, and growers and millowners seem equally satisfied with the results. The proposed new central mill on the Johnstone ought to be a great success, as owing to the great increase in cane cultivated, and the large amount of land available for sugar-growing there, a second mill will be the most advantageous. The mill site situated at Alligator Creek is a very good one, and has deep water frontage on the North Johnstone. A survey of the place is being made, and soundings taken by the local Government surveyor. The quality of the available land is very highly spoken of.

The grubs did considerable damage to cane on the Johnstone last year—at least 300 acres must have suffered more or less, the cane on some farms being almost completely destroyed. The grub beetles are being destroyed year after year, but in what quantities I am unable to state. I saw some land, however, there on which for ten years previously it had been tried to grow cane, but without success. This had now been abandoned for cane-growing, and was fenced off for grazing purposes. The destruction of cane by grubs in the other districts is very little indeed.

The area under cane is steadily increasing on the Johnstone, the Herbert, and in Cairns, and though cane is backward the prospects for this season are very good. Up to three weeks ago no damage had been done this year by grubs.

Mourilyan plantation has advanced very rapidly by first-class cultivation, and also by destruction of the grub beetle. The cane looks particularly well and healthy, and the mill work last year was very good indeed. Both plantation and mill reflect the greatest credit on the manager and his staff.

Green manuring is extensively practised, particularly on the Johnstone, where the farmers have now had many proofs of its advantages. The favourite there is Black Mauritius Bean. It is usual to sow about 25 lb. Black Mauritius Bean per acre, which yields about 16 tons of vine and roots. Preference is given to Black Mauritius Bean, since it can be left for 6 months after sowing, the vine is dense and keeps the soil free from weeds; while Red Mauritius Bean and cow pea require to be ploughed in 3 or 4 months after sowing. Of the two last mentioned, about 1½ bushels per acre are sown. The time of sowing is from October to middle of December. The bean, if so planted, comes up well, and afterwards the excessive rainfall does not do much damage. The soil is very porous and the natural drainage good; water does not lie at the roots of the crop. If sown in the middle of December, the crop obtained is usually poor.

The green manure is usually sown by a kanaka, who follows behind the plough, when the land is being broken up or a previous cane crop is being ploughed out. Ploughing out costs about 9s. per acre, and sowing green manure about 3s. 2d.

Though the green crop is rolled preparatory to being ploughed in, a large percentage is lost for manurial purposes, owing to the difficulty of ploughing under in the very open porous soil of the Johnstone.

Planting operations are commenced as soon after March as the rain will allow. The cane is usually planted continuously in drills about 10-12 inches deep, though some prefer 6 inches. About 30 cwt. of cane per acre is used for planting. Cross ploughing costs about 6s. per acre, inclusive of cost of horse. Harrowing costs 10d. or 1s. per acre; and planting, including cutting cane for plants, draying, cutting up plants, laying, and covering up, costs 18s. to 20s. per acre. Covering by hand to a depth generally of 3 inches or 4 inches (but according to circumstances) is preferred to covering by chain harrow, as, with the latter, the soil is unevenly distributed, and lumps will probably be covered in as well as fine earth. The general practice is to use plant cane for seed, but from past experience a number of farmers are in favour of planting first ratoon cane; the former plants come up quicker than the latter, but the latter better resists spells of wet or dry weather.

Up to the time the cane is 4 months old it will probably receive three scarifyings and three weedings. Scarifying costs about 2s. per acre, and weeding about 7s. The first trashing takes place usually when the cane is 7 months old, and it is not trashed again till about four weeks before cutting. Trashing high, or stripping as it is sometimes called, is not extensively practised. Trashing costs, if the cane is fairly straight, about 8s. or 10s. per acre, but if crooked or lying down the cost would probably be 12s. to 14s. per acre.

The new cane agreements with the C.S.R. Company, on the Johnstone, provide for ploughing in the trash and not burning it, also to fallow one-third of the cane area each year. The average area of farms on the Johnstone is 50 acres, and at Mundoo 30 acres, while few anywhere exceed 80 acres.—*Mackay Sugar Journal*.

Science.

BORACIC ACID.

By J. C. BRÜNNICH, F.C.S., Agricultural Chemist.

BORACIC acid, or boric acid and its sodium salt borax, are now so extensively used for the preservation of liquid and solid foods, such as milk, butter, cream, fish, and meat, that a short description of their origin and properties will be of general interest.

In all the preservatives sold in the local market, boric acid and borax are the chief ingredients, and, for comparison, I give below the analyses of some of these preparations, which were analysed at our agricultural laboratory at Gatton:—

Preservitas, a mixture of boric acid, borax, salt, and saltpetre, contained—

| | | | | | |
|----------------------|-----|-----|-----|-----|-----------------|
| Water, H_2O | ... | ... | ... | ... | 34.50 per cent. |
| Soda, Na_2O | ... | ... | ... | ... | 5.58 " |
| Boric acid, B_2O_3 | ... | ... | ... | ... | 47.39 " |
| Salt, $NaCl$ | ... | ... | ... | ... | 9.33 " |
| Saltpetre, KNO_3 | ... | ... | ... | ... | 3.00 " |

99.80

Sal Praeservare, a mixture of borax, boric acid, and salt, was found to contain—

| | | | | | |
|----------------------|-----|-----|-----|-----|-----------------|
| Water, H_2O | ... | ... | ... | ... | 34.30 per cent. |
| Soda, Na_2O | ... | ... | ... | ... | 4.96 " |
| Boric acid, B_2O_3 | ... | ... | ... | ... | 51.80 " |
| Salt, $NaCl$ | ... | ... | ... | ... | 8.52 " |

Preservaline, a mixture of boric acid, with a large amount of salt and some saltpetre, contained—

| | | | | | | |
|----------------------|-----|-----|-----|-----|-------|-----------|
| Water, H_2O | ... | ... | ... | ... | 37.70 | per cent. |
| Boric acid, B_2O_3 | ... | ... | ... | ... | 40.60 | „ |
| Salt, $NaCl$ | ... | ... | ... | ... | 20.16 | „ |
| Saltpetre, KNO_3 | ... | ... | ... | ... | 3.03 | „ |
| <hr/> | | | | | | |
| | | | | | | 101.49 |

Preservative, a simple mixture of boric acid and borax, contained—

| | | | | | | |
|----------------------|-----|-----|-----|-----|-------|-----------|
| Water, H_2O | ... | ... | ... | ... | 39.30 | per cent. |
| Boric acid, B_2O_3 | ... | ... | ... | ... | 57.26 | „ |
| Soda, Na_2O_3 | ... | ... | ... | ... | 4.35 | „ |
| <hr/> | | | | | | |
| | | | | | | 100.91 |

The saline substance borax, a salt of boracic acid and soda ($Na_2B_4O_7 \cdot 10 H_2O$), has been known for a long time, and is mentioned in some of the writings of the old alchemists. It was used as a flux in the working of metals, in the manufacture of artificial precious stones, in ceramic arts, and in medicine.

Borax was originally prepared in India and Thibet from the water of certain salt lakes. The impure whitish crystalline mass, obtained by evaporation of such water, was exported under the name of "tincal." Native borax is also found in Peru, Ceylon, California, and in large quantities in a dried-up lake in the Sierra Nevada.

In 1702, Homberg prepared, by distillation of a mixture of borax and green vitriol, a new substance, which he called *sal sedativum*, and which really was boric acid. Not until 1747 was it proved that borax was a compound of soda and this sedative salt.

In 1774, a Florentine apothecary (Höfer) found the same compound (*sal sedativum*) in the water of certain lagoons in Tuscany; and in 1815 a factory was erected to produce boric acid from the water of these lagoons on a large scale. At present most of the boric acid in the European market is derived from these small lakes (laguni) in the volcanic districts of Tuscany.

The pure boric acid forms white, translucent, scaly crystals, which have a pearly lustre, and feel unctuous to the touch. The acid has only a very slight bitterish taste, and possesses very feeble acid reactions. Cold water dissolves boric acid sparingly (7 parts in 100 parts of water), but boric acid is more soluble in boiling water (34 parts in 100 of boiling water), and very easily soluble in alcohol, and the alcoholic solution burns, when lighted, with a beautiful green flame.

Boric acid (H_3BO_3 or $B_2O_3 \cdot 3 H_2O$) loses part of its water when heated to 212 degrees, having at this temperature the formula $B_2O_3 \cdot H_2O$, and when heated further all the water is driven off, and the acid melts to a transparent glass (B_2O_3).

Both boric acid and borax are drugs included in the British Pharmacopœia, and the doses are given as from 5 to 30 grains, and from 5 to 40 grains respectively.

Boric acid in the form of solutions (1 part in 20 parts of water), and also in the form of an ointment (3 parts of powdered boric acid, with 5 parts of paraffin, and 10 parts of vaseline), is used as a very useful antiseptic application to wounds.

Solutions of various strengths are used as eye-wash, mouth-wash, &c., and a solution in glycerine as a paint for throats. The finely powdered acid, mixed with starch, forms a very useful dusting powder for infants.

The use of boric acid and borax as antiseptics has been known for the last 30 years, and the very slight taste of the acid prevents an easy detection in the case of being used.

The effect of boric acid on lower animal and vegetable organisms is well known, and its value as an antiseptic must be chiefly based on the fact that small doses prove fatal to the life of lower organisms. Higher plants are also affected by solutions of boric acid. Hötter proved that the green colouring matter of plants (the chlorophyll) is destroyed by boric acid, and consequently the assimilation of food arrested. Grass may be killed by an application of a solution of boric acid.

The effect of boric acid and borates on man and animals has been studied by a great number of scientists, but the results of their investigators are by no means conclusive. Some of the investigators—for instance, the French commission appointed to study the influence of boracic acid on the human system—found that it could be taken for a considerable time without injurious effects. More recent experiments proved that small doses of boric acid, or borax, have no injurious effects, whereas larger doses produce distinct physiological disturbances—a *danger will consequently arise if boric acid is used indiscriminately as a preservative*.

The Medical Officer for Health for East Kent, Dr. M. K. Robinson, has shown that a serious outbreak of illness, by which five out of the seven inmates of a house were suddenly attacked, was due to a repeated addition of a preservative containing boric acid. Milk was at once suspected, being not only taken by itself, but also with tea and in a blanc-mange.

It was found that the cook added preservative to the milk, which already contained boric acid when delivered by the dairyman. The result was that, by using the preservative twice, over-doses of boric acid had been administered. The remainder of the blanc-mange was given to nine fowls, of which five died; the rest suffered badly, but recovered.

Dr. Robinson states* that the addition of the drug should be regarded as an injurious adulteration. If such results, he says, can be produced in the case of adults, it is not unreasonable to presume that infants cannot take with impunity long-continued doses in their staple food. The opinion is general among physiologists that all preservatives, when effectual, either from their nature or quantity, in so injuring the micro-organisms which bring about fermentation or putrefaction of food as to inhibit their action, also injure those persons who consume such food. If a preservative substance can so influence the proto-plasmic integrity of bacteria and other low forms of life as well as of the higher forms like ordinary plants, it is difficult to conceive that the same basis of life-tissues in animals, especially that of the mucous membrane of the alimentary canal, should not also be injuriously affected, to say nothing of those beneficial bacteria concerned in the digestive processes.

In 1897, a "Lancet Special Sanitary Commission on the Use of Antiseptics in Food" was appointed, and consulted eminent members of the medical profession, as, for instance, Sir Benjamin W. Richardson, Sir Henry Thompson, Dr. Lauder Brunton, Dr. Pavy, Dr. F. J. Allen, and others on the subject.

In spite of a great difference of views expressed by the various authorities, they all agree in stating that the antiseptics taken continuously in food, in sufficient quantity, are injurious to health, and they all insist that the name and the quantity of the antiseptic used should be stated on a label attached to the article when sold. Some of the medical men demand a restriction on the amounts of preservatives used; others again wish for a complete prohibition of the use of antiseptics.

By the laws of Germany, France, Belgium, Switzerland, Italy, and most other countries, the addition of preservatives to foods is absolutely forbidden. In England, although an Adulteration Act has been in existence for a long time, no direct action to prevent the use of antiseptics has been taken; and only recently, since 1898, numerous convictions have been obtained for the addition of boric acid to milk and butter at a great many places.

* Quoted from the *Journal of the Royal Agricultural Society*, No. 37.

The *National Provisioner*, Chicago, 4th, 11th, and 18th February, reopens the question under the heading, "Is Boracic Acid Deadly?" and numerous evidence is given to show that the drug is not deadly, which no one hitherto had tried to prove. But nothing new is brought forth, and some of the statements, as, for instance, that 10,000,000 lb. of cured meat treated with borax are eaten annually in Germany, and over 100,000,000 lb. in England, have to be taken with more than the proverbial grain of salt, considering that the adulteration law is carried out so very strictly in Germany.

The conclusions to be drawn from the foregoing remarks are very simple. Sooner or later the use of boracic acid (although it is not a deadly poison) as a preservative will be everywhere greatly restricted, if not entirely prohibited. There is not the slightest doubt that milk, butter, meat, fish, &c., can be preserved without the use of drugs. Cold storage is the simplest modern method of preservation of foods, and is applicable with equal advantage on a small or on a large scale. If, with cold storage as preservative, a previous scrupulous care as to cleanliness, inspection of meat and dairies, modern processes, such as pasteurization, &c., go hand in hand, our products such as meat, butter, and other foods, can compete successfully with the products of other nations in the world's market.

The following is the article in the *National Provisioner* quoted by Mr. Brünnich:—

IS BORACIC ACID DEADLY?

M. de Cyon, the famous French chemist, made exhaustive experiments with boracic acids and meats. He added this acid to fresh food in doses up to 12 grammes per day, which is ten times as much as is used in Jourdes' process for preserving foods. He first experimented with dogs, and they all fattened. His final conclusions were incorporated in the "Annales d'Hygiene publique et de Medecine legale of the Academy of Science." He says:—(1.) Borax added to meat up to 12 grammes daily may be used for food purposes without causing the least disturbance in the general nutrition. (2.) Borax, substituted for common salt, increases the faculty of assimilating meat . . . even when the diet is exclusively albuminous.

Pure borax is free from albuminous and plumbic salts, as well as of carbonate of soda. It is this pure borax referred to by M. de Cyon.

Professor Panum, professor of physiology at Copenhagen, made extensive and exhaustive experiments with heat and boric acid, with the result that he believes in the complete harmlessness of boracic acid, which he also says is not an acid, but a salt. These experiments were conducted to see whether the method of preserving meats and foods by borax, which is so popular with Scandinavians, was injurious to the public health. The Scandinavians are a pretty healthy race at that. In the Jourdes' process of preserving meats with borax, the meat is not steeped in a saline solution. Its surface is lightly powdered over with chemically pure borax, from 1 to 2 grammes per kilo being used. "The meat remains in its normal state and retains all of its nutritive value," these scientists say.

After thorough examination and trial tests of boron salts or borax, the Sanitary Council of St. Petersburg, Russia, decided that borax or boracic acid contained nothing injurious to health. This learned body authorised the sale of borax and its acid for commercial and preserving purposes.

Food kept in a solution of 5 per cent. of borax is tolerated perfectly well by the human system.

One would think that such eminent chemists and scientists abroad, whose testimony is added to those of our own country, would be sufficient to clear the intelligent mind of its doubts as to the baleful effects of this simple antiseptic.

While the good old lady cries "horror!" in the next minute she washes her ulcerated mouth with a solution of boric acid, and cleanses that of her infant grandchild with the same solution.

The fatalities from carbolic and nitric acids have given people stage fright when the simple word acid is mentioned. Yet no one hesitates to use acetic acid or vinegar, though the stomach can take less of it than of this mild boric acid. Corned beef is delightful, even though it be preserved in a saline fluid, commonly called brine, which the stomach takes readily, and borax or boric acid is no more harmful than this solution of salt.

More than 10,000,000 lb. of cured meats treated with borax are eaten annually in Germany, and over 100,000,000 lb. in England. Boron salt is very soluble. It will not store up. It centres chiefly about the bladder and kidneys. It has no effect upon these if they are healthy, and in certain quantities, has a healing effect upon them. Saltpetre scares no one, yet, as a matter of chemical fact, it is a more powerful drug than boric acid, and stimulates the kidneys even more than boracic acid.

Dr. Thomas Bond, senior surgeon of Westminster Hospital, England, and Professor Atfield, the eminent chemist, who is editor of the "British Pharmacopœdia," both say that 1 per cent., or even more, of boracic acid is absolutely harmless. That is, 1 lb. of boracic acid to 100 lb. of meat.

NOVEL AND DARING EXPERIMENT.

Dr. Bond made a novel and daring experiment with this salt. He kept a child alive for a month in a solution of boracic acid. The patient sat all day in the bath, and was only taken out at night. The child took a large amount of the acid into its system.

"If I had used the ordinary solution of carbolic acid," observed the distinguished surgeon when called to settle the question of the evils of boric acid in foods, "it would have poisoned her. If I had used the ordinary surgical strength of carbolic acid, that is 1 to 40, it would have poisoned the child, whereas saturated in a solution of boracic acid, as much as the child would absorb did no harm; in fact, it did good. I give, internally, 10 grains of boracic acid to adults usually three times a day, sometimes four."

That is more boric acid than a whole quarter of beef would require upon it as an antiseptic, even if such a thing were used for that purpose.

If there is a septic disease, boracic acid prevents any septic action going on. Under its action, water, instead of becoming alkaline, decomposed, and stinking, remains pure.

Boric acid does not reduce the temperature. "I would rather go on with 10 grains of boric acid continued," remarked Dr. Bond in the important food case referred to, "than with 10 grains of nitrate of potash continued."

His purpose in taking a well-known substance like saltpetre is to minimise the evil.

The court put this question point blank to Dr. Bond: Which would you say was the healthier, a ham cured with boracic acid or one of the strong salty hams?

A.—Oh, I should say boric acid would be much more easily digested.

Q.—Hams treated with boracic acid, doctor?

A.—Yes, I think so, sir.

Q.—When you have 6 per cent. of boric acid in ham, is that injurious?

A.—I think not.

The witness then went to say:—"I give boric acid for decomposed food (eructation) in the stomach. It is good for that. Boric acid is antiseptic."

Whether boracic acid in small quantities is dangerous or not is considered by some to be a mooted question. Most of the best-known chemists assert that it is not. This acid has been tested over and over, time and again, with the same result—viz., that it is not deleterious to the health of man. The physiological side of this question has been investigated also in the artificial digestion of foods. The medical profession adds the testimony of its daily practice to the conclusions of the scientists.

Nearly every doctor in the land prescribes boric acid for uric troubles. Its salt is readily eliminated by the kidneys without injury to them. No physician of any note will urge any objection to the use of limited quantities of boracic acid in the food other than that it might retard, for a time, digestion. As it is prescribed in 10-grain doses three times a day for invalids with enfeebled digestions without the observation of any harmful results, the question of temporarily impeding the digestive process cannot be serious, because boric acid almost immediately disappears from the stomach after entering it. This is a physiological fact.

Experiments made by Professor R. H. Chittenden, Ph.D., of Yale College, in connection with W. J. Gies, led these gentlemen to say:—"Boric acid in doses up to 3 grammes a day is, so far as we can judge from our experiments, without influence either upon proteid metabolism, or upon the general nutritional process of the body."

Any well-versed physician will, for specific diseases or symptoms of them, advise his patient to drink liberally of Weis Baden and Vichy waters. The medicinal value of these waters is boron salt. The sick and the well drink both *ad libitum* with beneficial instead of harmful results. The effects of these daily draughts could not be but harmful if the intestinal tract were irritated thereby. The contrary is the experience of the users of these boron waters.

The effect of this acid upon the general health is very noticeable in another way. It is a remarkable fact that the employees who work in borax factories grow strong and healthy. Their whole systems become vigorous; their chests expand, and the entire body takes on life which is remarkable for its uniformity. If this salt, or its acid, were dangerous, its persistent poison would be felt in some of these factories after years of labour.

The Medical Council of the Home Office in Russia, after thorough inquiry, considered themselves bound to recommend to the Minister: "That pure biborate of soda used for the preservation of articles of food has not hitherto appeared to involve any objectionable results with regard to the health of the consumers."

Eminent British doctors thus stated their experience:—

Dr. A. G. Willington, M.R.C.S.E., says:—"I consider it very valuable in cases of gastric irritation and dysentery."

Such being the case, how could it cause such irritation and irregularity?

Dr. James Hill, Glasgow, F.R.C.S. Ed., formerly physician to the General Hospital, says:—"Gastro intestinal troubles, more especially with children, are very common, and for these I have freely prescribed borax without ever seeing anything but benefit."

"I never knew any injury or harm," says Dr. J. Vose Solomon, F.R.C.S., formerly surgeon of the Birmingham General Dispensary, "to follow the use of it when used internally or externally."

In no sense could boracic acids be considered as hurtful to the system as the decomposition in natural products which it arrests.

It is frequently urged as an evidence of the poisonous nature of boric acid that flies avoid its solution. Flies avoid all antiseptics. The presence of a fly is a witness to the presence of filth and decomposition. The life of a fly is of that which is poisonous to the human system. This insect avoids perfectly disinfected and antiseptic cleanliness. Flies do not avoid poisonous nor foul odours. Filth is the essence of their existence. Their absence from a borated surface is a tribute to the cleanliness of that salt.

Dr. Ward says that borax is used to great advantage in many cases. Milk containing boracic acid he would give to invalids and infants, and if the milk was not used within 10 hours after it had been taken from the cow he would prefer to have boracic acid added, even if the milk were refrigerated.

Plant Pathology.

POTATO DISEASE.

By HENRY TRYON,
Government Entomologist.

The following popular account relating to the nature and treatment of a special potato affection occurring in the portion of the Moreton Bay district mentioned having been regarded as possibly having an interest for others besides those resident therein, in response to whose representations it was prepared, has been accordingly submitted by the Department for inclusion in the *Journal*. It has, however, been prefaced by an excerpt, descriptive of symptoms, from the earlier Report (1894), alluded to in order to render it suitable for this further purpose:—

INTRODUCTORY.

THE potato affection brought under notice of the Department as occurring in the Gramzow and Alberton district of Beenleigh is identical with the new disease of this plant whose nature and cause were first made known by the writer in May, 1894, in a "Preliminary Report on a New Potato Disease prevalent in Southern Queensland," and that has been designated, in this colony, "Tryon's Potato Disease," and elsewhere "A Bacterial Disease of the Tomato, Egg-plant, and Irish Potato" (Erwin F. Smith).

This disease was probably brought into the Beenleigh district some years since in seed-potatoes. Its existence therein was apparently at first a matter of no comment; but of recent years it has become of more and more general occurrence, until now, to quote Mr. F. W. Peek, "it is very prevalent . . . the English varieties are greatly affected in the Alberton and Gramzow district, and slightly so in the Waterford district," and is inflicting very serious damage.

Prior to its discovery in Queensland in May, 1894, it existed—as there are good grounds for concluding—unrecognised both in the mother colony of New South Wales and in the United States of America. With regard to the latter territory, it has since the above event been positively identified, by comparison with the details of a comprehensive technical description prepared as the outcome of patient research by Dr. Erwin F. Smith, of the U.S. Department of Agriculture, and published in August, 1896, with a potato affection that had long occurred there greatly to the detriment of the potato-growing industry, but whose nature had not then been definitely ascertained.

SYMPTOMS.

[“The following are the characteristic features presented by the plant when diseased:—When the potato-plant is in process of vigorous growth, and exhibits every evidence of health, it suddenly commences to droop as if lacking moisture; it becomes after a few hours generally flaccid, its branches bend downwards, and its leaves have their edges turned inwards so as to expose their under-surfaces. These events happen in a few hours, without any premonitory symptom whatsoever. The plant thus smitten never revives, but gradually succumbs, the lower foliage eventually withering and becoming discoloured.

On examining the roots and tubers of a plant thus recently affected, it will be found that these are to all appearances perfectly sound. An attentive observer may, however, notice that the faint line—henceforth referred to as the 'ring'—which is seen on section of a healthy tuber at a short distance within and parallel to the surface, is more evident than usual from having become slightly translucent or even somewhat darkened in colour. At a later period an opaque, white, thick, tenacious fluid exudes in minute quantity from some of the eyes of the tuber; and it is this that, when the potato is removed from the soil and its surface permitted to dry, causes the earth to strongly adhere at these points, leaving behind—on being detached—a glossy film. If kept perfectly dry the tuber usually undergoes no destructive changes, but when remaining in the soil, or surrounded by a damp atmosphere, such supervene. The exudation from the eyes now becomes more copious, and, as judged by the presence of froth, issues with effervescence; the skin in their vicinity assumes

a pallid hue, and the tissue immediately beneath is quite soft and translucent, and has a fetid odour. The larger areas become superficially discoloured, though the line separating these from the still unaffected parts is not yet very pronounced. As the underlying tissue softens, the skin covering these areas readily collapses on pressure; scattered over its surface are white pimple-like elevations—marking the site of the lenticels or breathing-pores; rents appear in it, and from the ruptured surface emanate masses of a creamy pus-like tenacious substance. The whole potato is now most offensively odorous; but the pungent sour smell which arises from ordinary rotting potatoes is not noticeable. Exposed to the air, the tuber soon becomes, after blackening, a 'mere mass of corruption'; in the soil—as in a damp chamber—it is transformed into a receptacle filled with a white slimy fluid, that, when the diseased plant is raised, streams out.

If tubers in which the initial stage in the progress of the disease is past are cut across, it will be found that the softening of the tissue commences here and there just beneath the surface, and between it and the 'ring,' and continues to develop in this position until two-thirds of the superficial tissue is completely broken down, and may, in fact, be removed by washing; leaving the central portion still solid, not even as yet discoloured, and with irregular bounding surfaces as if it had been gnawn into. The cut surface on exposure to the air commences almost immediately to assume a light-brown rust-like colour, especially along the course of a band separating the portion of the tissue that is still intact from that which is already disorganised. This alteration soon, however, becomes general, the solid tissue being the last to participate in the change, excepting only the centre itself. It, too, gradually becomes of a more and more intense hue, until almost the whole surface is ultimately dull black. Step by step the solid tissue participates in the softening and decay encroaching inwards from without.

The time that is occupied in these destructive changes is greatly influenced by meteorological conditions. When warmth and moisture prevail it is a mere question of hours, so that not infrequently, even when the haulm is still quite green, the tubers themselves may be found to have already completely broken down. How rapid is this decay in its progress is illustrated in the following incident:—A selector at Ravensbourne, whilst unearthing a diseased crop, which had been affected at a late stage in the growth of the potato, picked out some mature tubers which were exceptional for their size and apparent soundness. Placing these in a shallow excavation in the soil, he covered them almost immediately with earth, but on exposing them a few days later, in the presence of the writer, many in consequence of the disease, whose occurrence was in their case previously overlooked, were already in a semi-fluid putrescent condition. With regard to the tissue of the stem, this gradually decays from the base upwards, the central pith, which is perhaps the first part of it to be visibly affected, being early abnormally moist and light-coloured.*

Though occasionally an entire crop may be smitten within 2 or 3 weeks, the disease does not, as a rule, at once affect it to the full extent of its subsequent distribution, but for days after its first manifestation continues to spread through the cultivation, by the intervals between affected plants or groups of plants being obliterated or bridged over by fresh outbreaks. . . . Isolated plants along a row may alone be subjected to it, and, perhaps, only partially so, or it may affect patches of varying size and configuration; though neither the form nor the extent of these diseased areas seems to be in any way related to any special contour of the land or to any local variation in its texture or other physical feature.

All varieties of potatoes growing in the districts in which the disease occurs seem to be liable to its attacks, amongst them being Early Rose, Brownell's Beauty, Circular Head, Snowflake, &c.

* Since this was written it has not infrequently been observed that the wilting of the haulm has preceded the occurrence of any decay of the tubers beneath. In such instances there has been reason to infer infection of the plant through insect inoculation.

It may become manifest at any period in the life of the potato-plant after the latter has once appeared above ground. . . . As a rule, however, the plants which generally evince the disease are from 5 to 7 weeks old, and its retarded occurrence is restricted to crops usually that have been planted before the cold season has passed.

Neither the onset of the disease nor its degree of virulence appears to be influenced by the physical texture of the soil or its chemical constitution. . . . The elevation, aspect, contour, and drainage of the land are likewise without influence on its occurrence.

Again, it is met with, as often as not, in the case of potatoes which are being grown on newly broken up ground, or where they have not been preceded by any other crop. On the other hand, on soil, precisely similar to that which has yielded diseased tubers on the first occasion of its being cultivated, five good crops have been raised entirely free from the disease, before the one in which it eventually occurred.

It occurs also on land upon which the potato crop exhibiting it has been preceded by other crops, such as maize or oats, which have been grown continuously for two or more seasons.

Again, it is also felt notwithstanding different methods have been pursued in preparing the 'seed,' and the cultural operations in raising the crop have been varied. Under some circumstances it may even be concluded that the more the land is stirred the less is the immunity from its attacks.

It visits both the winter and summer crop to an almost equal extent."—*April, 1894.*]*

When potatoes are grown continuously, crop after crop on the same ground, the extent to which the disease manifests itself generally becomes greater and greater with each successive planting, and thus, from a small beginning, a few isolated plants only originally evincing its presence, it may ultimately pervade the entire area devoted to the cultivation of this esculent.

NATURE AND CAUSE.

It is caused by a minute germ, plant-microbe, or bacterium (too small to be seen by aid of an ordinary microscope), that lives and multiplies in the vessels that traverse every part of the plant, even extending to the minutest ramifications of these in the roots and leaves. These so-called "sap-vessels" or tubes, it completely chokes up with a sticky, tenacious, pus-like fluid, that is composed of millions of these tiny forms of life.

And it is by reason of the vast numerical increase of these germs that the plant becomes, as it were, asphyxiated, whereupon the haulm, after wilting, dies and the tuber commences to decay—a process that under ordinary conditions of growth is soon perfected.

The germ or active agent in causing the disease can live and multiply outside and quite apart from the potato-plant for a considerable time, and, owing to the possession of this faculty on its part, it is possible to artificially produce the disease—either directly by infecting the plant or indirectly by acting similarly to the soil—at will. There are grounds for concluding, however, that it gradually loses its vigour and power of originating the malady (in other

* These are the leading characteristics of the disease from the farmer's point of view; and although many of them relate exclusively to the malady, yet for its accurate definition it would be necessary to dwell also upon the precise relation in connection with it of the bacillus to whose presence and action it is primarily due, and the characters presented by this organism itself—including both its morphological as well as its physiological features, as displayed whilst in association with its victim, as well as when living in other special media. Such a description, with imperfections in some particulars, was given in the illustrated manuscript report of April, 1894, which is here cited, under the lengthy section of it, entitled "Cause." But for a full and able account from this point of view the reader is, however, referred to Dr. Erwin F. Smith's Technical Bulletin, "A Bacterial Disease of the Tomato, Egg Plant, and Irish Potato," forming Bulletin No. 12 of the Division of Vegetable Physiology and Plant Pathology of the U.S. Department of Agriculture, issued in December, 1896, which, whilst setting forth "certain suggestions in the way of preventive measures that might be adopted," was "intended mainly to put on record (also) the results of investigations concerning the life-history of the organism causing it."

words, the virus becomes attenuated), unless it can periodically re-enter its host plant or plants. In addition to the ordinary potato-plant, hosts are afforded by both the tomato and egg plants, and possibly also by other members of the natural order (*Solanaceæ*) to which these, together with the potato, belong.

The alternate mode of existence on the part of the germ, to which allusion has been made, can be passed for a considerable time in the soil itself. This accordingly may become infected, and therefore capable of communicating the disease to potato-plants or tomato-plants, &c., grown from clean seed or seed-tubers planted therein, even after many months have elapsed since its contamination or infection has taken place.

Infection of the soil may be brought about, in the first instance, by the decay or breaking up of any portion of a diseased plant (for instance, root, tuber, stem, or leaf), within or in contact with the soil; or in a secondary manner by the transference of earth that has been once thus infected to soil that is previously uncontaminated, such transference being capable of being accomplished by implements, especially by the plough and moving water during drainage from a higher to a lower level, &c.

The disease may further be conveyed from plant to plant as a result of accidental inoculation, such inoculation being capable of being brought about by insects whilst indulging in their leaf-eating habits, and visiting successively unhealthy and healthy plants, the germs of the malady becoming attached to their jaws during the former occupation.

In addition to this, the germs of the malady may be temporarily associated with the potato tuber, especially when infected soil has become attached thereto, or when it has come in contact with diseased and rotten examples; and thus they may be conveyed to long distances to originate, when this is once used as seed, new occurrence of the malady.

Such dissemination, moreover, may also be brought about by the employment of potatoes for seed purposes that harbour the disease in a latent or undeveloped condition. For it must be borne in mind that the rotting or decay of the tuber, by which the disease is usually recognised, is merely a secondary change; and that when commencement of the malady has been deferred until the tubers have been nearly ripe, they will, after being lifted and kept under conditions of comparative dryness, not undergo, in many cases, these destructive changes, although they are actually subject to its presence.

Notwithstanding the numerous ways in which this disease can be thus propagated and become distributed, it usually happens that more than one season will elapse, subsequent to its first appearance, before the potato malady will become general throughout a plot of ground. It will at first manifest itself here and there in a sporadic manner, isolated plants being at first affected. These, however, if unattended to, will serve as new centres for dissemination, so that successive crops manifest it in greater and greater extent.

The microbe, the cause of the disease, when isolated from the potato-plant, loses its vitality, and therefore its power to act in this capacity, when it has become thoroughly dried or has been submitted to a high temperature such as is frequently experienced during our Queensland summers.* It is also killed by contact with chemical substances, several of which are available for this purpose, even though their employment may not be admissible in practical agriculture.

TREATMENT.

Land in which this potato disease has once manifested its presence should be subjected to a process of quarantine; an effort being made, in the first place, to deal with occurrences of it within its limits, to disinfect the soil therein, and to prevent the extension of the disease further afield.

1. As soon as the disease is recognised by the drooping and wilting of the foliage, the affected plant should be lifted in its entirety and removed from the

* The thermal death-point (ten minutes' exposure) has not been determined exactly, but is probably about 52 degrees C. (93.6 degrees Fah.) It certainly is above 51 degrees C. (91.8 degrees Fah.) and below 53 degrees C. (95.4 degrees Fah.).—E. F. Smith, *op. cit.*, p. 18.

field, care being taken to leave no part behind, whether tuber, root, stem, or foliage. (Thus by no means should the common practice of pulling up the haulm and casting it on one side be persisted in.) Such action should be taken as soon as the first symptoms of the disease are recognised, since an affected plant never recovers, and whilst it remains in the field it is an immediate source of disease for other plants around and will also, in due course, infect the soil in which it grows.

2. The ground in which the plant has grown should then be opened out, so as to expose the soil that has been adjacent to the roots to the influence of sunshine and the drying action of the atmosphere. A little lime applied at the same time will contribute to the result to be derived from these influences—viz., that of killing the plant-microbe.

3. In lifting the crop endeavour, as far as practicable, to deal separately with those plants that do not evince disease, and by no means mix sound and diseased potatoes in the same heap, bag, or other receptacle. Especially is this necessary if any of the crop is intended for subsequent use as seed. Whenever practicable, however, procure fresh seed from some outside source, though even in this case care should be taken that the disease be not present in connection with it, either latent or undeveloped.

4. In ploughing and subsequently cultivating, avoid as far as possible carrying the soil forward with the implements or teams from ground in which a diseased crop or diseased plants have grown to that in which such has not occurred; and, generally speaking, mixing together presumably uncontaminated and contaminated soil.

5. When the crop has been lifted and the preceding measures have as far as possible been complied with, the ground should be kept in a state of clean fallow, so that by frequent tillage as much of the soil as possible may be exposed to heat and sunlight.

6. Moreover (as there are some grounds for concluding), benefit may be derived from applying to the soil that has already become infected by the germs of the disease, and before replanting it afresh with potatoes, some chemical substance which, whilst acting as a mineral fertiliser, will at the same time destroy its powers of communicating the malady to the crop grown in it. At present, however, there is not sufficient evidence derived from experiment to warrant any specific recommendation in this connection.

7. The two preceding recommendations contemplate cases in which the entire soil of a farm is disease-infected, and it is necessary to plant potatoes afresh in ground wherein it has already manifested its presence. But as a general rule an effort should be made to provide that one crop of potatoes does not succeed another upon the same soil, if the malady has once shown itself. Even a single intervening crop of an entirely different description—e.g., maize or broom millet, &c.—will not always meet the requirements of the case, but two or more will need be raised. Otherwise persistence of the disease with increased virulence and more general occurrence is almost inevitable. But, of course, plants that belong to the same natural order as does the potato (*i.e.*, Solanaceæ), and which are also addicted to the presence of the same malady, are not admissible for intervening crops—a remark that especially applies to the tomato.

NOTE.—Justification for advocating this procedure is found in the experience of other districts. One person to whom it was recommended for adoption in March, 1894, writes in May of the present year as follows:—I have tried many remedies with little success, with one exception, for I have found that, after planting two successive crops of oats, barley, or rye, the disease disappears altogether. Many of the farmers of . . . are adopting the same course.

8. In any fresh planting, especial attention should be given to the condition of the seed. If there be any history of the occurrence of the disease in the crop from which it has been derived, or there is any probability of its having been subjected to the action of the infecting germ, it should, prior to being planted, be passed through a weak solution of sulphate of iron, containing not less than

1 oz. to every gallon of water. This fluid should be held in a wooden tub. Potatoes that have been derived from a distant source should not, by reason of this circumstance, be regarded as necessarily "clean."

9. The immediately preceding suggestion has reference to cases in which the seed, though possibly carrying the germ, is not itself diseased. But the latter condition may occur, and it should therefore be subjected to a very close scrutiny, in order to discover whether it is sound or otherwise; and, if unhealthy, discarded and destroyed. The following appearances will indicate the occurrence of the malady in a latent or temporarily undeveloped state—

- (a) A wetness at the eyes, accompanied by a slight exudation of a froth-like matter, when the seed is kept warm and damp, as, for instance, by covering it with a wet sack.
- (b) Sunken brown or blackish-brown areas on the surface, or (in white-skinned potatoes) patches of dark discolouration showing through the outer skin.
- (c) Adherence of soil to the eyes, which soil, when removed, will appear to be covered, where in contact with the bottom of the eye, with a greyish glossy film (dried gum).
- (d) A potato being cut across with a sharp and clean knife, and the sap upon the exposed surface being allowed to dry off, small droplets of a whitish, glossy, pus-like matter will appear at places along the course of the line or ring that runs a short way within the margin nearly parallel thereto, except where it sends an extension to any eye that may be cut through. These droplets are especially discernible when the section is looked at obliquely, when their bright lustre brings them into view. A small patch of decay present along the indistinct line alluded to, or between it and the outside of the tuber, may also be usually regarded as indicative of the presence of the disease. Potatoes cut in preparation for planting should always be examined with the object of detecting such appearance in view, and suspicious sets rejected and burnt.

10. These recommendations as to treatment are based on a recognition of the cause and fundamental nature of the disease as set forth in general terms in the first section of the report, and that have been revealed for the first time by the writer as the outcome of patient research. They may be supplemented by others that it is within the capacity of the intelligent farmer himself to devise, now that he has been enlightened on these points.

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A "Preliminary Report on a New Potato Disease prevalent at Ravensbourne, at Corinda, and in other parts of Southern Queensland," by the writer, was submitted by him on 27th April, 1894. This contained sections dealing with the following subjects:—Symptoms; Mode of Occurrence; History of Occurrence; Amount of Injury; Other Outbreaks; Cause (including description, mode of occurrence, and development on artificial media of the bacillus—illustrated by figures); Conclusion (recommendation as to treatment). This memoir was neither printed at the time nor subsequently, but a summary of it was published by the Department of Agriculture, and this forwarded to different papers and institutions. This summary appeared in the various Queensland daily and weekly journals, including the *Queenslander* of 12th May. It was also printed in the "Annual Report, Queensland Department of Agriculture, 1893-4, Brisbane, 1894." Again, an abstract of it, written by Professor Schimper, of Bonn, was contributed to Dr. Paul Sorauner's *Zeitschrift für Pflanzenkrankheiten* for 1895 (*op. cit.* Band V., pg. 234). Further, Professor B. T. Galloway (Chief of the Division of Vegetable Physiology and Pathology of the U.S. Department of Agriculture), in acknowledging it—the receipt—at the time stated as follows:—"I have read with interest the account of the New Potato Disease; and while I cannot say positively that what you have described occurs here, I think it very



VAGINULA SLUG (On Cabbage).

A—*V. Hedleyi* (Simroth) and Eggs.B—*V. Leydigi* (Simroth).

probable we have isolated cases of it every year. The disease you describe seems to be very similar to one attacking the tomato in various parts of the country, and known here under the name of 'Southern Tomato Blight,' " *in litt.* 18-7-1894.

In the spring of 1895, the Assistant Pathologist (Dr. Erwin F. Smith) in the department so ably presided over by Professor Galloway—prompted, it may be, by the writer's discovery, with whom also he had been in communication—commenced an extensive series of microscopic examinations and plant inoculations in the laboratories and greenhouses of the U.S. Department of Agriculture in Washington, made field observations in August, 1895, and resumed his laboratory investigations in the following year. As the outcome of this extended research, he published an important paper entitled "A Bacterial Disease of the Tomato, Egg Plant, and Irish Potato (*Bacillus solanacearum* n.sp.)," as Bulletin 12, Div. of Veg. Phys. and Path., U.S. Dep. of Agr. Dec. 1896.

In a foot-note at the commencement of his memoir, Erwin F. Smith writes:—"A bacterial disease of potatoes and tomatoes has also been reported by Henry Tryon from Queensland, where it is said to be very destructive." He then gives references to the summarised version of the report already alluded to, and adds:—"In the article on 'Gumming of Cane,'* the potato and tomato organism is called *Bacillus vascularum solani*, and no description is given, and I have not been able to find any, or to decide from the brief account of symptoms whether or not the Australian disease is identical with our own." To this it may be added that, having carefully studied the statements in E. M. Smith's able memoir pertaining to the American disease, and repeated some of the experiments that relate to the morphological and physiological characteristics of the bacillus referred to therein, and that go more fully into this aspect of the subject than had previously been attempted here, the conclusion—previously suggested by Professor Galloway—that the American and Australian diseases are identical is fully borne out, a verdict that any investigator, endowed with but little less of the spirit of scientific caution exercised by E. M. Smith, might have pronounced even in the meagre light of the information, derived from this Queensland source, that partially illuminated the question.

* The paragraph alluded to occurs on page 14 ("Gumming of Cane," Department of Agriculture, Brisbane, June, 1895), and is as follows:—"I may also add that, in a new potato disease that I have lately reported upon, and which I have had an opportunity for reinvestigating in the course of this inquiry, microbes, scarcely distinguishable from those that are met with in diseased sugar-cane, and which I have designated *Bacillus vascularum solani* (the microbe occasioning 'gumming' of sugar-cane having already been entitled *Bacillus vascularum* by N. A. Cobb), occurs under precisely the same circumstances—i.e., clogging up the vessels of the stems, roots, and rhizomes, and, in the initial stages of the disease, nowhere else; and that seedling examples of another solanaceous plant, viz., the tomato—raised in soil in which these microbes have been liberated—develop a disease apparently quite similar to that which the potato plants, from which they have been derived, present, and which, amongst other features of resemblance that it shares, has these identical microbes clogging up its vessels also. So that the connection between the microbes and the occurrence of the disease with which they are associated in both plants is that of cause and effect.

Plant Pests.

VAGINULA SLUGS.

[*Vaginula Hedleyi* and *V. Leydigi*.]

By HENRY TRYON, Entomologist

(PLATE CXIX.)

INTRODUCTORY.

SOME fourteen years since the writer commonly remarked the presence of a large and peculiar slug in the Brisbane Botanical Gardens, which was then to be found as it traversed the footpaths, early in the day during the summer months, especially

if wet prevailed. How long prior to this it might have been observed there cannot perhaps be now ascertained. It is stated, however, by W. French, one of the staff of that establishment, that it was to be met with there already in 1883, in which year his official connection with the institution commenced. Two apparent varieties—one nearly black, and the other pale yellowish-brown—were thus early recognisable.

Beyond the fact that they represented the genus *Vaginula*, nothing was known of their systematic relationship until 1889, in which year a former scientific colleague, C. Hedley,* submitted specimens to D. F. Heynemann, who had not only, in conjunction with Fischer, written a monograph on the genus, but had also described a related slug, now known as *Atopos australis* (Heynemann), Simroth, from this colony. Heynemann in due course referred the specimens to Dr. H. Simroth, of Leipzig University, who pronounced the hitherto regarded varieties to represent two different species, that he named respectively *Vaginula Hedleyi* and *Vaginula Leydigi*; the latter specific title being a tribute to a venerated teacher, Geheimrath Leydig.

BIBLIOGRAPHY.

NOTE.—Dr. H. Simroth has devoted two memoirs to the technical description of these species of *Vaginula*; both are entitled “Über einige *Vaginula*-Arten.” The one is published in the *Zoologischer Anzeiger* for 1889 (*op. cit.* vol. xii., pp. 551-556 and 574-578, Leipzig, 1889), and the other in the *Zoologischen Jahrbüchern* for 1891 (*op. cit.* Abth. f. Syst., vol. v., part 5, pp. 861-906, plates xlix.-lii.). The *Anzeiger* paper is fully summarised in the *Journal of the Royal Microscopical Society* for 1890, in a note entitled “Some Species of *Vaginula*” (*op. cit.* pp. 21-22), and is also referred to by C. Hedley in a paragraph “On *Vaginula Leydigii* and *V. Hedleyi*, Simr.,” in *Proceedings Linnean Society of New South Wales* for 1891 (*op. cit.* ser. 2, vol. 5, p. 897). Dr. Simroth’s paper in the *Zoologischen Jahrbüchern* has unfortunately not been seen by the writer, but he is informed by the last-mentioned authority that it is “the paper in chief”; also that the plates reproduce a series of coloured and uncoloured drawings (the work of C. Hedley himself) of the animals, their eggs, &c., and exhaustively illustrate the anatomy—most fully dealt with also in the text. The student of the genus may also consult, with great profit, Dr. C. Semper’s *Land Mollusken*, part vii., in vol. iii. of his “Reisen im Archipel de Philippinen, Wissenschaftliche Resultate” (*op. cit.* pp. 291-327, plates xxiv.-vii.), in which is embodied descriptions of the species of *Vaginula* contained in European collections at a time just prior to the date of Dr. Simroth’s first paper.

INCREASE.

For some years subsequent to the time at which these slugs were first remarked as occurring in the Botanical Gardens they remained apparently quite restricted to the limited area that these embrace, but already in 1895 they had extended in the Brisbane district far beyond them, for at that date they were very numerous on the hills immediately to the south on the opposite side of the river, especially in certain gardens on Highgate Hill and in Musgrave Park. At the present time they have reached almost all the suburbs of the city; thus it has been certified on good authority that they are not only at Milton and Toowong, but that “they extend from the Junction on the Ipswich road, all around about West End to as far as the Albion, if not further”; also, that “they are very plentiful at the Acclimatisation Society’s Gardens, Bowen Park.” Where they occur also they are, as a rule, to be met with in immense numbers. In the parks of North Brisbane, during warm wet nights, they may be encountered in such numbers in the grass that every square foot of surface seems to be occupied by one or more. Mr. M. B. Bernays also has informed the writer that “where he is living near Highgate Hill it is usual to see, after nightfall, regiments of slugs, of at least three varieties, making their way from their haunts towards tender plants of all descriptions, be they vegetables or flowers. Within the last week (second week in April) I have collected as much as seven measured quarts of these vermin, and apparently have made very little progress towards their annihilation.”

* “Ein guter Conchyliolog und speziell über Nachtschneckenanatomie” (H. Simroth).

DESTRUCTIVE HABITS.

It is only of late years also that the fact of their being addicted to feeding upon garden plants has been a subject of complaint.* Even up to date no special depredations occasioned by them in the Botanical Gardens, where they have been so long established, have been brought under notice, although the writer has seen there *Mesembryanthemum* plants partly consumed by them. W. French, whose duties as propagator there should afford special opportunity for observing any destructive propensity that the slugs might manifest, has not been heard to regard their presence there with much concern, although for some time past it has been found necessary to protect young "annuals" from their attacks. That they may, however, prove very destructive to certain plants has now been definitely established.

The first instance of their depredations was afforded by an observation made by J. C. Boyd, of the Immigration Office, who, in 1893, remarked their presence upon the leaves of cabbage grown in the grounds attached to the offices of the Department of Agriculture, and further noticed that they made large holes therein as they fed upon their tissue. This discovery has since been confirmed abundantly by others. Thus M. B. Bernays states generally they partake of "tender plants of all descriptions, be they vegetables or flowers; also, that they eat cauliflowers, cabbages, turnips, broad beans, lettuces amongst esculents; and stocks, cinerarias, dianthus, &c., amongst ornamental plants. Asparagus they eschew, even the tender shoots of fancy varieties being avoided." To this list may be added, on the authority of another observer, carrots, eschalots, tomatoes, and young dahlias. Newly planted *Coleus* cuttings they will again wholly consume. Indeed, so emphatically has this destructive habit been displayed, that a correspondent who has experienced their depredations has been led to anticipate that "if they are not stopped in their ravages they will soon—i.e., in a few years—become quite as much of a curse in the vegetable garden as is the Fruit Fly (*Tephritis*) in the orchard." It is generally in their early stages of growth that plants subject to these attacks are injured; and this is sometimes exclusively the case. In addition to the kinds above mentioned they also reject many others, e.g., the pea, and fortunately do not attack the ordinary grasses. On the other hand they consume some of our weeds, e.g., Fat Hen (*Chenopodium*). Hence the lessening degree to which this plant is to be remarked as present in our local waste places.

J. C. Boyd, who, as already remarked, was the first in Queensland to bring under notice the destructive propensities of *Vaginula* Slugs, states that they are very partial to the ripe fruit of the tomato, climbing up the plants themselves to gain access to it; that they will even gnaw through the hard rind of the under surface of pumpkins, when these are lying on the ground, and thus determine the invasion of a special form of rot that originates at the site of injury; that they are especially addicted to attacking cabbages, cutting down the young plants, and eating holes (*vide* Plate) in the under leaves of older ones; that they are very destructive to French beans; that other vegetable garden plants, also, they may partake of, especially when these are quite young. Parsley heads they do not seem to affect, though they will eat mint. Strawberry plants, again, remain comparatively untouched, only the tips of the young shoots being at times injured.

DESCRIPTION.

The following general description, supplemented by a study of the accompanying plate, whereon are depicted life-size photographic representations of the slugs themselves, will aid in their recognition:—

They are elongate-oblong in outline, their length and breadth being as 3 to 5 when non-extended and at rest, whereas they are four times as long as broad, or even relatively longer, when stretched out as they are when crawling. They are

*Although the species of *Vaginula* are of such numerous occurrence within the tropics, the writer can only recall a single instance of destructive habits being attributed to them. Thus Dr. P. Fischer writes:—"Ils ravagent les plantations de café, de tabac, ainsi que les jardins potagers."
--*Manuel de Conchyliologie*, p. 493 (1887).

narrowed both forwards and backwards, the front and hind extremities being rounded and projecting both over the head as well as the tail end. The upper surface has a uniform contour, and is gently convex from side to side, and slopes downwards also to both the fore and hind end. It is also of a dull aspect, though moist, no mucous being poured out as in ordinary slugs. It is, moreover, completely occupied by fine granules and intervening pores. It is known as the mantle. In front are two pairs of tentacles arising from the head. The upper pair are stout, finely ringed, and end in a knob containing a minute eye spot. Beneath these are two, even stouter ones; these are much shorter than the preceding, and are terminally cleft, or each ends in two distinct tubercles. The under surface, which is lighter coloured than the upper, is almost quite flat, and is divided into three distinct portions, each extending the length of the slug. The central of these is the so-called foot, and that on each side is the under portion of the mantle. These three divisions may be equal in width, or the foot may be less than a third of the breadth. This foot has a more glossy lustre than has the remaining portion of the flat under surface, owing to the presence of mucous. It is also crossed by closely placed very fine lines or striæ. The head may be withdrawn to a greater or less extent into a cavity. The mouth organs include the ordinary jaw and radula. The former is arched and longitudinally folded, whilst the latter carries longitudinal series of cusp-bearing teeth. The male genital orifice is just behind the right lower tentacle, whereas the female one is at the side beneath, near the right border of the foot, not far from the middle of its length. The animal has the two sexes combined in one individual. The adults in both species measure 3 inches in length as ordinarily extended during crawling.* They may be distinguished one from the other by the following characters:—

Vaginula Leydigi, Simroth, when fully developed, is pitchy-brown or almost black above, and there extends along the centre of the back a fine yellowish line, which does not quite reach either end. The back also is gently and regularly curved from one side to the other. The under surface is of a brownish-white colour, the foot having a slight yellowish hue. The latter, extending from one end to the other, occupies about a third of the breadth.

When young the animal is of a much lighter colour, it being usually pale-brown, with numerous dark-brown specks above, these often forming an obscure network. Beneath it is greyish-white.

The eggs are soft, translucent, oval, slightly flattened at one extremity, about twice as long as broad, and of a honey-yellow colour. These appearances being partly due to the nature and form of their contents: for they are surrounded by a thick transparent colourless covering that presents at one extremity a short thick blunt prolongation. They are large, measuring 8 mm. (4 lines) x 4 mm. (2 lines).

Vaginula Hedleyi, Simroth.—This species is of a pale yellowish-brown or drab colour above. The upper surface also is not as convex as is the back of *V. Leydigi*, and not so uniformly arched from side to side, being somewhat flattened towards each lateral border. Beneath it is brownish-white. The central area or foot does not occupy a third of the breadth, but only two-thirds or less thereof.

The eggs are generally similar in appearance to those of the preceding species, but are distinctly smaller, measuring 6.5 mm. (3 lines) x 3.5 mm. (1½ lines).

A close insight into the anatomy of these two species, as Dr. Simroth has remarked, reveals a surprising amount of difference also in the form of almost all their internal organs. For an indication of the nature of this—which is beyond the scope of this article to describe—reference must be made to either of the two memoirs that have emanated from him, and that have been already alluded to (page 64). It must be understood, however, that it is in these structural details that the characteristic features of the two species reside.

* Generally speaking, they may be stated to resemble the slug-like mollusc of such frequent occurrence under logs and stones in mangrove swamps, and which are referable to the genus *Onchidium*—so much so indeed that earlier writers, e.g., Guilding, confounded the two under this one title.

HABITS.

The *Vaginula* slugs are almost exclusively nocturnal in their habits, though they may be found early during wet mornings on the move, usually, however, engaged then in returning to their haunts. They creep readily over the ground and even along perpendicular walls, and travel relatively long distances without intermission. These haunts are—beneath logs, old timber, stones, and rubbish generally; underneath the floors of out-houses; in bush-houses or shade-gardens; in dry walls; and wherever in fact dark damp hiding-places near the ground can be found. They also enter cracks and other openings into the soil, and even burrow into this when it is loose, being able by extending their bodies to squeeze through quite narrow passages. Thus they will insinuate themselves amongst the roots of plants, especially when these form a more or less compact mass. In the latitude of Brisbane they almost entirely hibernate; and are thus to be found during May, June, and July both night and day, not only in any of the above hiding-places but also often beneath stones some inches from the surface. Here they usually occur, congregated together, both young and old. When removed, however, although at first they are motionless and contorted, they are not long in displaying evidence of vitality and thus proceed to “make off.” When crawling over rough surfaces they are wont to discharge from the surface of the foot a thin layer of transparent mucous, which soon dries and becomes a transparent shining film. This, however, they do not do to the same extent as do ordinary slugs (*Limax*, *Arion*, &c.)

They are oviparous, and deposit their batch of eggs beneath stones or logs, usually in shallow cavities. Each slug lays forty* or more eggs, and these are both large and conspicuous, as described. They issue from the side of the body, beneath, as represented natural size on Plate CXIX. The eggs have a moist sticky surface that causes them to adhere, to a certain extent, to foreign bodies. They are placed as laid in a single mass—the individual eggs being held together not only by their natural adhesiveness, but also by threads of a clear mucous-like matter. The entire lump may also be covered by fragments of slug-excrement that may serve to mask their true nature. The process of egg-laying seems to occur at intervals throughout the summer months, being continued until almost the end of April; and as each slug is both a father and a mother—though congress of two may be required that reproduction ensue—a few individuals soon give rise to a very numerous progeny, and hence the hordes in which they occur. The time occupied in arriving at maturity has not been ascertained. So also the duration of their natural lives.

NATIVE COUNTRY.

There are good grounds for considering that though these particular species of *Vaginula* Slugs have not been described as occurring in any other country, or have not been identified with any of the species noted as existing elsewhere, they are to be regarded as importations. The grounds on which this conclusion is based are the following:—

(1.) For a considerable time after they had been first noticed in Brisbane, no evidence of their occurring in the district beyond the small area in which they were then to be met with was forthcoming, notwithstanding close scrutiny into the nature of our local molluscan fauna on the part of others as well as especially on that of the writer had been made: nor have explorations by naturalists in different parts of Queensland revealed their presence further afield amongst other related denizens of the scrub and bush.

(2.) They are quite of a different type from the other members of the family *Vaginulidæ* that have been reported as occurring in Queensland, and which are prismatic, instead of being plano-convex in section, and which hence—as well as on other grounds—have been relegated to the genus *Atopos* by Simroth (*Zeitsch. f. Wiss. Zool.*, vol. lli. 1891). This objection is not, however, wholly tenable, since *Vaginula* and *Atopos* co-exist in the Philippine Islands.

* An individual of the light-coloured species, *V. Hedleyi*, laid whilst under observation fifty-five eggs, and twenty-two eggs were found in apposition to an example of *V. Leydigii*.

(3.) The species of *Vaginula*, although very numerous, only exceptionally extend so far from the equatorial region as is the latitude of Brisbane—27 degrees south—where they have to hibernate.*

(4.) For some considerable period prior to their discovery, the Brisbane Botanical Gardens had received, from time to time, consignments of plants from regions in which either *Vaginula* Slugs are already known to occur, or may be expected with great probability to be found. And the fact that they remained undescribed until 1889, and have not as yet been identified with species indigenous to other lands, is intelligible when it is recognised that the *Vaginulidæ* of certain climes, apparently rich in species—e.g., in the East Indies—have exceptionally been made the objects of systematic study. They were, however, undoubtedly undescribed (*selbstverständlich neu*, to use the words of Dr. Simroth in his first-mentioned memoir) when C. Hedley first made them the object of special study, though at the time of writing this paper (September, 1889) it does not appear to have occurred to him that they were not truly indigenous to Southern Queensland. It is satisfactory, however, to be able to state that the opinion of the writer with regard to this question is now shared by so competent an authority; for C. Hedley, in a recent communication, states as follows:—

I always did suspect these slugs to be foreign, and your information that they have increased so as to count amongst "Pests" confirms the idea. That the many active collectors who have searched Queensland for Mollusca, including ourselves, have never met with it elsewhere is a suspicious circumstance. That it should occur in the Botanical Gardens suggests introduction with foreign plants. It is remarkable that any species should first be made known to science in the person of erratic wanderers from native soil. You will recall the case of *Bipalium kewense* as a parallel one. I cannot at the present moment remember another. On the other hand, this is a genus that might be expected to occur in Queensland. Two of its allies—*Atopos australis*, Heynemann, and *A. prismatica*, Tapparone-Canefri—are already reported from your territory. From New Caledonia a still nearer relation is found in *Vaginula plebeia*, Fischer.—*Australian Museum, in lit.*, 15-5-99.

NATURAL ENEMIES.

This aspect of the subject has not as yet claimed attention. None of our native birds have been observed engaged in feeding upon these slugs, though it is anticipated that the latter might be favoured by the Ibis. The same remark applies to our indigenous batrachians—frogs and toads; but their numbers and rate of increase seem to far exceed the capabilities of this description of possible slug-enemies. No Acari have been found preying upon the beetle larvæ, as is sometimes the case with ordinary slugs elsewhere. But on two occasions M. B. Bernays "has noticed a steel-blue red-headed centipede (? *Heterosoma* sp.), about 4 in. in length, on the backs of large individuals of the blackish-coloured variety of *Vaginula*, which latter were practically in their embraces. The slug in each case at the time moved vigorously, but its captor seemed to have full charge. In fact, it seemed to be a struggle for existence on the part of the former." This predatory habit, however, is one which, for obvious reasons, could not be availed of in practical procedures having for their object the repression of the pest. Domestic poultry—including ducks, which are under certain circumstances ravenous true slug-consumers—do not appear to affect *Vaginulas*, or, if they partake of them, have not appreciable influence in lessening their numbers.

PREVENTIVE MEASURES.

As this slug has so well established itself in the district, and has manifested not only its adaptability to our climate, but also its powers of rapid increase in numbers, as well as its capability of injuring garden plants, its further dissemination

* The *Vaginula* Slugs are essentially tropical or subtropical animals, occupying a zone extending about 20 degrees on each side of the equator, being known to occur, almost invariably within this torid region, in South America, Mexico, West Indies, East Central Africa, Mauritius, the Seychelles, Ceylon, Burmah, South China, and the East Indies. Exceptionally they pass beyond this limit, being found (according to Dr. Semper) on both sides of South America to 38 degrees of south latitude along the coastal districts, and they have also been reported from Hongkong (23 degrees north latitude).

should, if possible, be opposed. Although its capability for extending its range of occurrence—as a result of the exercise of its natural faculty of locomotion—is relatively great, there are grounds for concluding that its present distribution has been principally brought about, unintentionally, through traffic in living plants. The slug has been found even within flower-pots containing growing ferns, having doubtless entered at the drainage-hole when in an immature condition; it has also been met with in cases in which plants have been either established or packed, prior to transmission; and, moreover, its eggs have been remarked in the soil which these boxes have contained. In fact, any case of plants left during a summer's night in a spot frequented by them, unless a specially tight one, is almost certain to be visited by, and subsequently harbour, the pest. The roots of certain plants, and, above all, densely-clothed rhizomes, even when all soil has been removed, may again be occupied by the slug or its eggs. Bird's-nest ferns, if left lying upon the ground in the haunts of the animal, offer a favourite retreat for it. It is accordingly expedient that all plants, and the packages that have contained them, be carefully examined upon their receipt, and the soil, if practicable, burned. The roots, again, should be washed under a tap to remove any adherent matter, care being especially taken that no slug, however small, or slug's egg, be allowed to escape detection and destruction. Consignors of plants should also be required to forward them—whenever practicable—without any soil being contained in the case or package. These injunctions, moreover, are applicable to plants that are received from all tropical or sub-tropical lands, as well as to those transmitted or brought from Brisbane or its suburbs. They should be especially respected by those residing along our sea-board. The climatic conditions obtaining west of the Dividing Range may, it is thought, prove an obstacle to their establishment in that part of the colony—except quite locally there, in shade-gardens or bush-houses.

When slugs are established in the immediate neighbourhood of a garden, or have even already become denizens of the cultivation itself, it is still possible to protect portions of land that are either already free from or have become artificially relieved of their presence, by the employment of certain deterrents. Amongst these the use of "tobacco-waste" may especially be recommended. This is composed of the discarded mid-rib, or stout central rib, of the leaf after it has been cured, and at present may be obtained at tobacco factories at a merely nominal cost, say about 5s. per load. Applied to land, it has also the additional value arising from the fact that it is a fertiliser. Indeed, it is already availed of by pineapple-growers on account of possessing this feature. This waste has simply to be laid upon the soil so as to form a barrier around the portion of ground that it is purposed to protect from the slugs' visitations. A band of the width formed by three or four pieces of tobacco-waste laid side by side has been found, in the course of an experiment, to be adequate to confine the slug in a space of but a foot or two square, from which it would effect its escape in a few minutes were no such obstacle present to intercept its progress. On contact with this material, it secretes a thin film of transparent mucus from its strap-like foot, as if to protect it from injury. Should it succeed in finding its way on to a few pieces of the tobacco, its progress is soon stayed, and death ensues; for this material is not only repugnant but is also fatal to the pest. Already the employment of tobacco-waste, as has been stated by more than one correspondent, has been successfully resorted to in dealing with anticipated incursions of this slug. Of course, also, the application of tobacco-extracts—more than one of which is on the market—might be expected to prove similarly effective; but in using them it would be necessary to impregnate some absorbent powder with the fluid. Their employment, however, would involve a greater cost than would be involved in that of the waste product mentioned.*

* In mentioning the use of tobacco-waste, it is due to the writer to acknowledge his obligations to Mr. A. J. Boyd, editor of the *Queensland Agricultural Journal*, who was the first to bring under his notice an instance of its successful employment for the purpose mentioned.

Gas-lime, or ordinary stone-lime, may again be resorted to for forming a barrier for protecting plots or larger areas of ground, or indeed individual plants. So also ordinary soot. These, however, present the drawback of having their essential protective qualities impaired by rain.

Again, the slugs may be poisoned by taking advantage of their partiality for any farinaceous meal. To this some arsenical compound—*e.g.*, Paris green or London purple—is added for the purpose. The adoption, however, of this method is not recommended, as the toxic agent is slow in its operation and permits the animals to wander off.

Finally, there is the method of trapping or hand-picking. The latter operation is most successfully resorted to after nightfall. Owing, however, to the fact that the colour of the slug harmonises to a marked extent with that of the soil, many individuals always escape observation and capture. Moreover, it is a back-racking work, much more exacting, it is stated, than is ordinary digging. In trapping, objects are laid upon the ground overnight and visited during the following morning. Old boards or wet sacks are useful in this connection. So also are slices of vegetables, especially tomatoes, potatoes, turnips, and pumpkins.

The extermination of the pest, as urged in some quarters, is now altogether impracticable. This also might have been with truth affirmed fifteen years since, when its occurrence in the Brisbane district first came under notice.

DESCRIPTION OF PLATE.

A.—*Vaginula Hedleyi*, Simroth : One individual in act of ovipositing, eggs issuing from lateral opening.

B.—*Vaginula Leydigi*, Simroth. Feeding on cabbage-leaf.
Natural size. From photograph by F. C. Wills.

Animal Pathology.

TUBERCULOSIS IN SPAYED COWS.

MEASURES NECESSARY FOR PROTECTING CATTLE FROM INFECTION WITH TUBERCULOSIS DURING THE PROCESS OF SPAYING.

IN October, 1898, an article on the above subject by Mr. W. C. Quinnell, M.R.C.V.S. Lond., Government Veterinary Inspector, in the *Journal*, awakened much interest in grazing circles; and we have been requested to republish a portion of the article, dealing with the

NECESSARY MEASURES FOR PROTECTION.

Under this head, Mr. Quinnell wrote as follows :—

If it were possible to estimate the diminution of wealth which occurs by reason of preventable losses among stock, even in the course of 1 year, many no doubt would be considerably astonished.

I speak designedly of avoidable losses, for many cattle could be saved by the application of scientific principles and resources, especially when the methods which science would dictate in such cases are not difficult to understand nor to exercise.

It has been shown also that the disease is a contagious one; hence the necessity in the selection of subjects and *strict antisepsis*.

Whenever practicable, it would be a wise precaution to draft out those suspected of ill-health from amongst the mob to be spayed. Operate on the sound beasts first, and then on others according to degrees of indifference.

To prevent the infection of healthy animals by contagion, an ample supply of water and soap (Calvert's carbolic 20 per cent. in preference) is essential for the thorough cleansing of the operator's hands, instruments, &c., after each cow spayed.

Knife and hands could be further rendered aseptic by washing with an effectual antiseptic—

- (a) *Carbolic acid* 1 part, with 20 or 40 of water.
- (b) *Corrosive sublimate* 1 part, common salt $7\frac{1}{2}$ parts, water 1,000 parts.
- (c) *Zinc chloride* 1 part, water 80 to 100 parts.
- (d) *Sodium hydrofluosilicate*.—A recently discovered, effectual, non-poisonous, cheap germicide, used in proportion of 1 part to 500 water.

TUBERCULOSIS IN CATTLE.

THE following report by Mr. S. S. Cameron, M.R.C.V.S. to the Victorian Board of Public Health, on the efficacy of the tuberculin test as a diagnostic of tuberculosis in cattle, the results of evidently carefully conducted experiments, is published for general information. Although conducted in another colony, the experiments are, in all respects—so far as the actual test is concerned—equally applicable to Queensland, and the results support the contention of scientists in other countries, that, when properly carried out, the tuberculin test is infallible.

REPORT BY MR. S. S. CAMERON, M.R.C.V.S. TO THE BOARD OF PUBLIC HEALTH, ON THE RESULTS OF HIS USE OF TUBERCULIN IN CATTLE IN VICTORIA.

The investigation, the results of which are given in the subjoined report, was directed by the Board for the purpose of inducing stockowners and dairymen to exterminate tuberculosis from their herds, and also of elucidating the question as to the measures to be taken in Victoria in connection with cattle for the reduction of tuberculosis in man.

It had been shown, first in one and then in another part of the world, that tuberculosis was extensively prevalent among cattle. The transmissibility of the disease to man had been accepted by the highest authorities in those States where the matter had been investigated. And for the eradication of the bovine affection a reliable test, which was the first desideratum, had been found in tuberculin—a re-agent which, in competent hands, had proved to be, for practical purposes, all that was wanted. No sooner had these positions been established than the duty was recognised by the Governments of most civilised countries of affording to stockowners and dairy-farmers every possible aid in the extermination of tuberculosis, State moneys in large amount being voted for this special purpose—not so much for the protection of the pocket of the owners of cattle as for the protection of man against infection from cattle.

It was for this and other purposes that Mr. Cameron was appointed, on the urgent representations of the Board, as veterinary inspector on their staff; and at once the Board gave it out that Mr. Cameron's services would be available to those who would consent to have any animal that, in the opinion of Mr. Cameron, reacted to the tuberculin test in a manner indicative of tuberculosis immediately slaughtered and examined after death. Mr. Cameron's report shows the nature and extent of the work done by him in this direction. The result goes far towards demonstrating the same important truths as regards bovine tuberculosis in this country as had been found by other observers else-

where; and it may well serve as a source of encouragement for pressing forward the work that has thus been commenced, though some change be made in the conditions under which State aid shall in future be provided for the elimination of the bovine disease.

It must be added that the lectures and demonstrations given by Mr. Cameron on the living animal and at the *post-mortem* in the different localities where the investigations have been undertaken have proved of the greatest importance and value, as shown by the numerous reports given thereon in the Press, and by the fact that numerous owners of cattle have been induced thereby to have the test applied by competent persons to their own stock.

D. A. GRESSWELL, M.A., M.D., Oxon., Chairman.

18th March, 1899.

REPORT TO THE BOARD OF PUBLIC HEALTH, VICTORIA, BY MR. S. S. CAMERON, M.R.C.V.S., VETERINARY INSPECTOR TO THE BOARD, ON TUBERCULIN AS AN AID IN THE DIAGNOSIS OF BOVINE TUBERCULOSIS.

During the eighteen months prior to September, 1898, on directions from the Board, I subjected a number of dairy cattle, constituting the whole of the milking cows in 9 herds in widely separated parts of the colony, to the tuberculin test, the objects having been to demonstrate the value of the test as an aid in the diagnosis of tuberculosis, and to obtain some information as to the extent of the disease in the dairy cattle of the colony. Though the number of herds—9—and the number of cattle—267—forming those herds are not so numerous as to furnish a sufficient basis for estimating the extent of the disease in the colony, it may be remarked that the herds were, as already stated, in widely separated parts of the colony; that the animals comprising these herds were mostly young cows or cows in their prime, and above the average of dairy cattle in breeding, in condition, and milking qualities; and that the owners voluntarily submitted them to the test on the understanding that all those that might re-act would be destroyed, so that there is likelihood that the proportion of tuberculous animals found in the 9 choice herds tested—viz., 9 per cent.—is not in excess of that for dairy cows in the colony at large.

I shall give, first, the particulars concerning each herd, and then some of the lessons to be derived from the results of the investigation.

I.—PARTICULARS CONCERNING THE SEVERAL HERDS THAT WERE TESTED.

Table A sets out the number of herds and of cows tested, the number and proportion that re-acted, the number slaughtered and examined, and the localities where the investigations were conducted.

TABLE A.
GIVING MAIN PARTICULARS AS TO THE SEVERAL HERDS TESTED.

| Herd. | Locality. | No. of Cows Tested. | No. and Percentage of Cows that gave Definite Re-action. | | No. of Cows Slaughtered. |
|----------|-----------------|---------------------|--|-------------|--------------------------|
| | | | No. | Percentage. | |
| 1 | Leongatha... | 51 | 5 | 9·8 | 5 |
| 2 | Kyneton ... | 20 | 1 | 5·0 | 1 |
| 3 | Carlsruhe ... | 8 | | | |
| 4 | Sale... .. | 46 | | | |
| 5 | Tatura ... | 25 | 5 | 20·0 | 4 |
| 6 | Terang ... | 58 | 3 | 5·1 | 3 |
| 7 | Warrnambool ... | 39 | 9 | 23·0 | 9 |
| 8 | Warrnambool ... | 13 | | | |
| 9 | Leongatha... | 7 | 1 | 14·3 | 1 |
| Total... | | 267 | 24 | 9·0 | 23 |

I now pass on to the consideration of each herd separately, giving a description of the herd, the temperature charts, and particulars of all re-acting cows and their *post-mortem* appearances on slaughter:—

Herd I., Leongatha, South Gippsland.—This herd consisted of 51 milking cows, the majority being pure Jerseys or Jersey-Ayrshire half-breds. Thirty-two of these were cows between 3 and 6 years, and of the remainder not one was over 8 years old. The herd had been carefully selected during the previous 2 years, no animal yielding below 500 gallons of milk per annum, with a proportionate butter-fat value, being allowed to remain in the herd. All the animals were apparently healthy and in sleek milking condition, and were artificially fed with hay, chaff, bran, roots, &c., in winter, and ensilage in summer. Shelter-sheds were provided in all the grazing paddocks, and the general management of the herd was in other respects generous and careful.

The test was applied on 5th and 6th January, 1897. Koch's tuberculin of date 27th October, 1896, was used, in doses varying from 0·3 c.c. to 0·5 c.c., according to the age and size of the animal, and diluted with 0·5 per cent. sterilised solution of carbolic acid.

Five of the 51 cows gave re-actions, the highest rise in temperature varying from 4·4 degrees F. to 2·6 degrees F., and the mean rise varying from 4·1 degrees F. to 1·0 degrees F. All the animals that re-acted were slaughtered, and the temperatures, together with the *post-mortem* appearances of each, are given in Table B.

This herd was tested a second time in May, 1898, exactly 16 months after the first test. Six of the cows had been sold in the meantime on account of their failing to yield the standard amount of milk (500 gallons per annum). None of the remaining 40 cows, all of which, as already stated, had previously withstood the test, re-acted on this occasion.

TABLE B.

GIVING GENERAL DESCRIPTION, TEMPERATURES, AND POST-MORTEM APPEARANCES OF EACH OF THE RE-ACTING ANIMALS IN HERD I.

| Cow. | Description. | Age. | Temperature before Injection. | | | Temperature after Injection. | | | | Rise. | | Abnormal <i>Post-mortem</i> Appearances. | |
|-------|--|--------|-------------------------------|---------|-------|------------------------------|-----------|-----------|-------|----------|-------|--|---|
| | | | 6 hours. | 4-hour. | Mean. | 12 hours. | 16 hours. | 20 hours. | Mean. | Highest. | Mean. | Tubercular. | Other. |
| No. 1 | Prime milking condition; sleek and fat | 7 yrs. | 101·5 | 101·2 | 101·3 | 104·5 | 104·2 | 104·5 | 104·4 | 3·2 | 3·1 | Large coalescing tubercular abscesses throughout liver substance | Hydatid cysts in lungs and liver; flukes in liver |
| No. 2 | Prime milking condition; sleek and fat | aged | 102·5 | 102·0 | 102·3 | 105·7 | 105·8 | 105·8 | 105·8 | 3·5 | 3·5 | Extensive tuberculosis of intestines and mesentery; a few tubercular nodules in both lungs | A few hydatid cysts in liver |
| No. 3 | Fair milking condition; slightly hide-bound, with staring coat | 6 yrs. | 103·6 | 101·6 | 102·6 | 105·2 | 102·6 | 103·1 | 103·6 | 2·6 | 1·0 | Caseous tubercular nodules throughout liver and intestines | Flukes in liver; left lung hepatised in patches |
| No. 4 | Fair condition; hide-bound coat | aged | 101·6 | 101·0 | 101·3 | 104·8 | 105·7 | 105·7 | 105·4 | 4·4 | 4·1 | Tubercular abscesses and nodules in both lungs; walls of large intestines (cæcum and colon) studded with miliary tubercles; caseous tubercles in liver | Slight pleuritic adhesion of left lung |
| No. 5 | Prime milking condition; sleek and fat | aged | 101·4 | 101·4 | 101·4 | 102·0 | 104·5 | 104·2 | 103·6 | 3·1 | 2·2 | Small tubercular abscesses and nodules in both lungs, some grey, others caseous | Nil |

Herd II., Kyneton.—This herd consisted of 20 milking cows, mainly Shorthorn, Ayrshire, and Jersey crosses. Most of the animals were in their milking prime and in good condition. The herd had been gradually got together during the preceding 18 months with the view of supplying milk for a retail distribution. It was well managed in every respect, hand-feeding and housing at night in a well-ventilated sanitary byre being practised in the winter.

Test applied, 26th and 27th January, 1897—Koch's tuberculin; doses, 0.4 c.c. to 0.5 c.c.

One cow re-acted definitely, giving a maximum rise of temperature of 5.0 degrees F., and a mean rise during 34 hours of 3.1 degrees F.

Particulars concerning this cow are given in Table C.

TABLE C.

GIVING GENERAL DESCRIPTION, TEMPERATURE, AND POST-MORTEM APPEARANCES OF RE-ACTING COW IN HERD II.

No. 1 Description.—Big-framed half-bred Shorthorn-Ayrshire cow, 6 years old, in good condition and full milk—

| Temperature before Injection. | | | | Temperature after Injection. | | | | | | | | | | | Rise. | |
|-------------------------------|--------|-------|-------|------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|-------|--------|-------|--|
| 8 hrs. | 5 hrs. | 1 hr. | Mean. | 9 hrs. | 11 hrs. | 13 hrs. | 16 hrs. | 19 hrs. | 22 hrs. | 25 hrs. | 27 hrs. | 34 hrs. | Mean. | H'h't. | Mean. | |
| 101.8 | 101.4 | 101.6 | 101.6 | 104.8 | 104.4 | 104.8 | 105.2 | 106.6 | 105.0 | 104.4 | 104.4 | 103.0 | 104.7 | 5.0 | 3.1 | |

Post-mortem Appearances.—Tubercular patches in both lungs; tubercular lesions in right sub-lumbar lymphatic glands; grey nodules of tubercular character in the mammary gland (udder).

Herd III., Karlsruhe.—The herd consisted of 8 milking cows, all pure-bred pedigreed Jerseys, in good milking condition, and well cared for.

Test applied, 27th and 28th January, 1897—Koch's tuberculin; dose, 0.3 c.c. to 0.5 c.c.

None of the animals re-acted.

Herd IV., Sale, East Gippsland.—This herd consisted of 46 cows in good milking condition; ordinary dairy cows, with strains of Shorthorn, Jersey, Ayrshire, and Hereford. The herd was well managed and cared for, ensilage and other artificial foods being used regularly during the summer and winter months.

Test applied, 22nd and 23rd March, 1897—Koch's tuberculin; dose, 0.3 c.c. to 0.5 c.c.

None of the animals gave a definite re-action. In 2, however, the temperature rose sharply at the end of 12 hours to 104.6 degrees F. and 104.1 degrees F. respectively, the rise being 3.0 and 2.2 respectively; but this rise was not maintained for more than an hour, the temperature in both cows being again normal at the end of 14 hours. These two cows were re-tested a fortnight later, with the result that neither of them re-acted, the only alteration of temperature being a rise of 0.7 degrees F. in one case, and 0.2 degrees F. in the other, 10 hours after injection.

Herd V., Tatura, Goulburn Valley.—This herd consisted of 25 ordinary dairy cows in fair milking condition, well managed and cared for.

Test applied, 5th and 6th April, 1897—Koch's tuberculin; dose, 0.4 c.c. to 0.5 c.c.

Five of the 25 cows gave re-actions,* the mean rise in temperature varying from 3.8 degrees F. to 2.1 degrees F. Particulars concerning these 5 cows are given in Table D.

* During the previous 6 months the owner had lost 2 cows from a "wasting disease," which, according to the description of the symptoms given, was undoubtedly tuberculosis.

TABLE D.

GIVING GENERAL DESCRIPTION, TEMPERATURES, AND POST-MORTEM APPEARANCES OF EACH OF THE RE-ACTING ANIMALS IN HERD V.

| Cow. | Description. | Age. | Temperature before Injection. | | | Temperature after Injection. | | | | Rise. | | Abnormal <i>Post-mortem</i> Appearances. |
|-------|---|--------|-------------------------------|---------|-------|------------------------------|-----------|-----------|-------|----------|-------|---|
| | | | 4 hours. | 4-hour. | Mean. | 12 hours. | 14 hours. | 18 hours. | Mean. | Highest. | Mean. | Tubercular |
| | | | | | | | | | | | | |
| No. 1 | Good milking condition; apparently healthy | 6 yrs. | 102.4 | 101.5 | 101.9 | 104.5 | 103.6 | 104.0 | 104.0 | 2.6 | 2.1 | Tuberculosis in various organs (verbal report from owner). |
| No. 2 | Good milking condition; apparently healthy | aged | 102.2 | 102.0 | 102.1 | 105.8 | 105.6 | 105.5 | 105.4 | 3.5 | 3.3 | Tuberculosis in various organs (verbal report from owner). |
| No. 3 | Prime milking condition; apparently healthy | 7 yrs. | 101.8 | 101.5 | 101.7 | 103.7 | 105.2 | 105.0 | 104.6 | 3.5 | 2.9 | Extensive tubercular lesions in various organs (verbal report from owner). |
| No. 4 | Prime condition; nearly dry; apparently healthy | aged | 101.8 | 101.2 | 101.5 | 105.1 | 104.7 | 106.0 | 105.3 | 4.5 | 3.8 | Cow dried off and fattened for slaughter; no report of <i>post-mortem</i> appearances to hand. |
| No. 5 | Low condition; hide-bound; physical examination of chest gave indications of lung consolidation and abscesses | aged | 104.5 | 103.0 | 103.8 | 106.0 | 106.6 | 106.8 | 106.5 | 3.0 | 2.7 | Large masses of coalesced tubercular abscesses in both lungs; tubercular adhesion of lungs to pleure and diaphragm; tubercular pericardium (heart sac) and peritoneum; lymphatic glands extensively affected, especially bronchial, mesenteric, and sub-lumbar groups; tubercular abscesses throughout liver; tubercular nodules in both ovaries, in the udder, and right kidney. |

Herd VI., Terang, Western District.—This herd consisted of 58 milking cows and heifers of mixed breeds and in moderately good condition. The majority were station-bred, and under five years of age.

Test applied, October, 1897—Koch's tuberculin; dose, 0.3 c.c. to 0.5 c.c.

Three of the cows re-acted definitely, the mean rise in temperature varying from 3.7 degrees F. to 1.9 degrees F. These cows were slaughtered and examined. Particulars regarding them are set forth in Table E.

TABLE E.

GIVING GENERAL DESCRIPTION, TEMPERATURES, AND POST-MORTEM APPEARANCES OF EACH OF THE RE-ACTING ANIMALS IN HERD VI.

| Cow. | Description. | Age. | Temperature before Injection. | | | Temperature after Injection. | | | | Rise. | Abnormal <i>Post-mortem</i> Appearances. | |
|-------|---|--------|-------------------------------|---------|-------|------------------------------|-----------|-----------|-------|----------|---|--|
| | | | 2 hours. | 4-hour. | Mean. | 11 hours. | 13 hours. | 15 hours. | Mean. | Highest. | Tubercular. | Other. |
| No. 1 | In good milking condition; apparently healthy | aged | 102.0 | 101.2 | 101.6 | 105.0 | 101.8 | 105.5 | 104.1 | 3.9 | Egg-sized tubercular abscesses throughout both lungs; tubercular abscesses diffused throughout liver substance; one small tubercle in right kidney; broken down tubercular abscess in right hind-quarter of udder | Hydatid cysts in various organs; fluke in liver. |
| No. 2 | Moderate condition; apparently healthy | 4 yrs. | 102.2 | 101.6 | 101.9 | 105.5 | 105.6 | 105.7 | 105.6 | 3.8 | Large broken down tubercular abscess in bronchial lymphatic glands. | Nil. |
| No. 3 | Fair condition; apparently healthy | 3 yrs. | 101.5 | 101.6 | 101.6 | 103.2 | 103.7 | 103.6 | 103.5 | 2.1 | Tubercular nodules throughout liver substance | Hydatid cysts in lungs. |

Herd VII., Warrnambool, Western District.—This herd consisted of 39 cows of mixed breeds, with strains of Shorthorn, Ayrshire, and Alderney. They were all young animals (between 3 and 7 years), in splendid milking condition, apparently sound, and had been selected during the previous 12 months and practically without limit as to price on account of their milking qualities.*

Test applied, 25th and 26th February, 1898—Koch's tuberculin; dose, 0·3 c.c. to 0·5 c.c.

Nine of the 39 cows gave a definite re-action, the mean rise in temperature varying from 4·4 degrees F. to 1·8 degrees F. They were all slaughtered and examined. Particulars regarding each of them are given in Table F.

TABLE F.

GIVING GENERAL DESCRIPTION, TEMPERATURES, AND POST-MORTEM APPEARANCES OF EACH OF THE RE-ACTING ANIMALS IN HERD VII.

| Cow. | Description. | Age. | Temperature before Injection. | | | Temperature after Injection. | | | | Rise. | | Abnormal Post-mortem Appearances. |
|-------|---|--------|-------------------------------|---------|-------|------------------------------|-----------|-----------|-------|----------|-------|---|
| | | | 4 hours. | 4-hour. | Mean. | 11 hours. | 13 hours. | 19 hours. | Mean. | Highest. | Mean. | Tubercular. |
| No. 1 | Prime milking condition; apparently healthy | 5 yrs. | 101·7 | 102·0 | 101·9 | 106·0 | 106·0 | 106·9 | 106·3 | 5·0 | 4·4 | Tubercular nodules from size of pea to walnut in both lungs; tuberculosis of bronchial, hepatic, and mesenteric lymphatic glands; tubercular nodules in liver. |
| No. | Prime milking condition; apparently healthy | 6 yrs. | 100·9 | 100·9 | 100·9 | 104·0 | 104·3 | 106·5 | 104·9 | 5·6 | 4·0 | Coalesced tubercular abscesses in lungs and liver; bronchial, hepatic, and post-pharyngeal lymphatic glands extensively tubercular; tubercular nodules in udder. |
| No. 3 | Fat young heifer, first calf; apparently healthy | 3 yrs. | 101·6 | 101·8 | 101·7 | 105·6 | 105·2 | 105·0 | 105·3 | 3·9 | 3·6 | Tubercular abscesses in lungs and bronchial lymphatic glands; too large tubercular abscesses in udder, and mammary lymphatics completely replaced by tubercular matter. |
| No. 4 | Good milking condition; sleek and fat; apparently healthy | 7 yrs. | 101·5 | 102·0 | 101·7 | 105·4 | 105·6 | 103·9 | 105·0 | 3·9 | 3·3 | Very extensive tubercular lesions throughout lungs, liver, intestines, and principal groups of lymphatic glands. (This cow is the dam of No. 9 in this table.) |
| No. 5 | Prime condition; fat; apparently healthy | 6 yrs. | 100·9 | 101·0 | 101·0 | 104·1 | 104·5 | 105·3 | 104·6 | 4·3 | 3·6 | Post-pharyngeal lymphatic glands enlarged and tuberculous; tubercular nodules throughout mesenteric lymphatics; and a few small nodules in liver. |
| No. 6 | Good milking condition; apparently healthy | 6 yrs. | 101·2 | 101·5 | 101·4 | 105·6 | 105·1 | 106·6 | 105·9 | 5·2 | 4·5 | Post-pharyngeal lymphatic glands enlarged and tuberculous; tubercular nodules in liver. |
| No. | Good milking condition; apparently healthy | 6 yrs. | 101·3 | 102·0 | 101·7 | 103·2 | 104·0 | 103·3 | 103·5 | 2·3 | 1·8 | Very slightly affected, two small isolated tubercular nodules in liver only. |
| No. 8 | Sleek and fat; apparently healthy | 4 yrs. | 101·3 | 101·5 | 101·4 | 104·5 | 106·0 | 103·9 | 104·8 | 4·6 | 3·4 | Tubercular nodules throughout lungs, and complete tubercular invasion of bronchial lymphatic glands. |
| No. 9 | Good milking condition; apparently healthy | 3 yrs. | 101·2 | 101·4 | 101·3 | 105·8 | 106·0 | 103·5 | 105·1 | 4·7 | 3·8 | Extensive tubercular lesions throughout lungs, liver, and mesenteric lymphatic glands. (This cow is the daughter of No. 4 in this table.) |

* In a letter dated 10th March, 1898, the owner writes: "All appeared to be in good health, and were, I may say, rather above the average in quality, and our factory test has been satisfactory."

Herd VIII., Warrnambool, Western District.—This herd consisted of 13 Shorthorn and Jersey cows in prime condition. All the cows were home bred, no cows having been introduced into the herd for a number of years.*

Test applied, 26th and 27th February, 1898—Koch's tuberculin; dose, 0·4 c.c. to 0·5 c.c.

None of the cows re-acted definitely. In one the temperature rose 2·1 degrees F., but this cow had calved 24 hours previous to injection, and was suffering from congestion of the vulva and vagina.

Herd IX., Leongatha, South Gippsland.—This herd comprised 7 half-bred Jersey cows recently purchased for their milking qualities. They were in fair condition and well cared for.

Test applied, 4th May, 1898—Koch's tuberculin; dose, 0·4 c.c. to 0·5 c.c.

One of the 7 cows re-acted, showing a maximum rise in temperature of 2·4 degrees F., and a mean rise of 1·7 degrees F. during 21 hours. Particulars regarding this cow are given in Table G.

TABLE G.

GIVING GENERAL DESCRIPTION, TEMPERATURES, AND POST-MORTEM APPEARANCES OF RE-ACTING COW IN HERD IX.

No. 1 Description.—A six-year-old Alderney, in moderate condition.

Temperature Chart.

| Temperature before injection. | | | Temperature after injection. | | | | | | | Rise. | |
|-------------------------------|----------|-------|------------------------------|-----------|-----------|-----------|-----------|-----------|-------|----------|------|
| 3 hours. | 4 hours. | Mean. | 11 hours. | 13 hours. | 15 hours. | 17 hours. | 19 hours. | 21 hours. | Mean. | Highest. | Mean |
| 101·5 | 102·7 | 102·1 | 103·4 | 103·4 | 104·1 | 103·3 | 104·2 | 104·5 | 103·8 | 2·4 | 1·7 |

Post-mortem Appearances.—Tuberculosis of post-pharyngeal lymphatics; and small tubercular nodules throughout lungs.

II.—SOME OF THE LESSONS TO BE DERIVED FROM THE PARTICULARS SET OUT ABOVE.

Firstly, as to the distribution of the disease in the animal. On analysing the tubercular lesions present in the 23 cows slaughtered, it will be found that 14 of the 23 were affected with "generalised tuberculosis"—that is to say, that the disease existed in two or more organs or groups of organs, remote from one another, and unconnected with each other except by the blood stream. The 14 were—Nos. 2 and 4, Herd I., Table B; No. 1, Herd II., Table C; Nos. 1, 2, 3, and 5, Herd V., Table D; No. 1, Herd VI., Table E; Nos. 1, 2, 3, 4, and 9, Herd VII., Table F; and No. 1, Herd IX., Table G. The remaining 9 were cases of "localised tuberculosis," in which the lesions had not spread beyond the organs or groups of organs affected and their special lymphatic glands. These 9 were—Nos. 1, 3, and 5, Herd I., Table B; Nos. 2 and 3, Herd VI., Table E; and Nos. 5, 6, 7, and 8, Herd VII., Table F.

Secondly, as to the probable method of infection. If the anatomical situation and pathological age and condition of the various lesions be analysed, an approximate idea of the method of infection in about half the cases may be obtained. For instance, in the case of 6 of the cows (viz., Nos. 1 and 3, Herd I., Table B; No. 3, Herd VI., Table E; and Nos. 5, 6, and 7, Herd VII., Table F) it may be assumed that the primary infection was by ingestion. In the case of 5 others (viz., No. 5, Herd I., Table B; No. 1, Herd II., Table C;

* The owner writes 10th March, 1898 :—"As to the 13 cows tested, I have had the herd for the last 12 years, and have culled heavily for milk supply. The original animals were either Durham or Durham crossed with Ayrshire. I rejected any animal which did not give a minimum of 500 gallons of milk annually, and reared the heifer calves of those retained in the herd. These cows have never had bought cattle running among them, and now have well-sheltered paddocks to run in. The young stock have always been carefully reared on healthy fresh milk separated on the place and kept in clean buckets until wanted. One cow is very old, and is kept more as a pet and breeder than for present profit. Most run from 3 to 5 years.

No. 2, Herd *VI.*, Table E; and Nos. 3 and 8, Herd *VII.*, Table F) it may be assumed that the primary infection was by inhalation; while in the case of the remaining 12 (Nos. 2 and 4, Herd *I.*, Table B; Nos. 1, 2, 3, and 5, Herd *V.*, Table D; No. 1, Herd *VI.*, Table E; Nos. 1, 2, 4, and 9, Herd *VII.*, Table F; and No. 1, Herd *IX.*, Table G) the method of infection is doubtful on account of the diversity of organs or distinct groups of organs invaded, and also the want of differentiation in age appearances between the lesions in the various parts affected.

Thirdly, as serving to show which organs are most likely to be attacked, reference may be made to Table H, which gives the frequency with which the several organs were found affected with tubercle.

TABLE H.

SHOWING THE FREQUENCY WITH WHICH DIFFERENT ORGANS OF THE RE-ACTING ANIMALS WERE FOUND AFTER SLAUGHTER TO BE TUBERCULAR.

| Organs, &c., Affected. | No. of Animals in which Organs were found Tubercular. | No. of Animals Slaughtered. | Percentage of re-acting Animals in which Organs were found Tubercular. |
|--|---|-----------------------------|--|
| Lungs (and pleura) | 13 | 23 | 56.5 |
| Liver | 13 | 23 | 56.5 |
| Lymphatic glands | 10 | 23 | 43.4 |
| Bronchial lymphatics | 7 | 23 | 30.4 |
| Mesenteric lymphatics | 4 | 23 | 17.4 |
| Post-pharyngeal lymphatics | 4 | 23 | 17.4 |
| Sub-lumbar lymphatics | 3 | 23 | 13.0 |
| Hepatic lymphatics | 3 | 23 | 13.0 |
| Mammary lymphatics | 1 | 23 | 4.3 |
| Udder | 5 | 23 | 21.7 |
| Intestines and Mesentery (net of bowels) | 4 | 23 | 17.4 |
| Various organs | 3 | 23 | 13.0 |
| Kidney | 2 | 23 | 8.7 |
| Ovaries | 1 | 23 | 4.3 |
| Peritoneum | 1 | 23 | 4.3 |
| Pericardium (heart sac) | 1 | 23 | 4.3 |

Perhaps the most striking feature in connection with the foregoing table is the large percentage of cases in which the udder was affected—21.7 per cent. of the animals that were slaughtered, and actually 1.87 per cent. of the whole of the milking cows tested. This is especially interesting and important, seeing that, whereas the percentage of cows found to be tuberculous in any form is far below what has been demonstrated by many observers in other countries, the percentage of diseased animals with tubercular udders is higher than has been recorded elsewhere with one or two exceptions. In fact, the majority of observers conclude that the number of animals with diseased udders is seldom more than 5 per cent. of affected animals, and is usually about 2 per cent. It is somewhat difficult to account for this inordinately high proportion of diseased udders in the herds examined. In this connection it is perhaps significant that comparatively little attention is paid by the dairy-farmers here to ordinary inflammations, chills, or “colds” of the udder, and that the loss of a quarter is usually considered of little moment. For it is indisputable that, after an inflammation or injury of any kind has affected a part, the latter is left in a weakened state and less resistant to the invasion of specific organisms such as the tubercle bacillus.

Another feature of the *post-mortem* examinations that may be noted is the free distribution of the disease among the different organs of the body, the uterus and spleen being the only important abdominal organs that were free from tuberculosis in the 23 cows slaughtered.

Fourthly, as to the reliability of the tuberculin test as an aid in the diagnosis of tuberculosis in cattle. It will have been observed that the whole of the 23 cows slaughtered out of the 24 which re-acted were found on *post-mortem* examination to be tuberculous in greater or lesser degree. The result of these

experiments so far, then, seems to force the conclusion that when, as a result of the injection of tuberculin, a definite re-action is obtained, the animal is affected with tuberculosis. It is true that some observers have been unable to find traces of the disease on *post-mortem* examination after the re-action has been apparently definite; but how far such inability to find the lesions has been due to careless, insufficient, or hurried search on *post-mortem* it is difficult to say. In other cases, notably in one or two States in America, where the test has been carried out under adverse and unsuitable conditions (in saleyards, market-stalls, &c.); and where sufficient care has not been used in interpreting the temperature-records and other factors component to a "re-action," numerous mistakes have been made. When, on the introduction of the test, operators were not as familiar with its intricacies and delicacies as they now are, mistakes occurred occasionally; and in one case as many as 11 per cent. of animals which were supposed to have re-acted were found to be free from the disease on *post-mortem* examination. But the accumulated experience of the past five years in all countries in the world in which the test has been put into operation seems to prove conclusively that, while errors and mistakes have been made, not more than an infinitesimal number are chargeable to the failure of tuberculin itself. Professor McFadyean, M.B., F.R.C.V.S., &c., Dean of the London Veterinary College, who at first was openly sceptical as to the universal reliability of tuberculin, has recently announced that when the test is carried out in an intelligent and discreet manner it is "practically infallible." And the results of the small series of experiments carried out in Victoria would seem to endorse that dictum.

The question arises, however, and has been asked, whether, in case there is no re-action after tuberculin injection, it is certain that no tuberculosis exists. That is to say, whether in some cases tuberculin fails to indicate the disease when it is present. Perhaps this does occur occasionally—so rarely, however, and in such circumstances that for practical purposes the reliability of tuberculin in a negative as well as an affirmative sense may be definitely affirmed.

In this connection it will be of interest to note the following particulars:—On the occasion of the second testing of Herd I., in May last, the chairman authorised me to purchase one of the healthy cows, that had not re-acted on either occasion, for *post-mortem* examination; and the owner, on being made acquainted with the object of the purchase, at once generously offered to give up another of the non-re-acting cows for a like purpose. The selection of the cows was left to the farm manager, who chose two which, prior to application of the test, he had been strongly suspicious were tuberculous. The temperature charts of each of these cows on each occasion, together with a brief history and details of the *post-mortem* examination of each, are given in Table I.*

TABLE I.

GIVING THE TEMPERATURES BEFORE AND AFTER INJECTION OF TWO NON-REACTING ANIMALS.

| | Cow. | Temperature before Injection. | | | Temperature after Injection. | | | | Variation. |
|------------------------------|-------|-------------------------------|------------|-------|------------------------------|----------------|-----------------|-------|------------|
| | | Four hours. | Half-hour. | Mean. | Twelve hours. | Fifteen hours. | Eighteen hours. | Mean. | |
| First Test—January, 1897 ... | No. 1 | 102.5 | 102.0 | 102.3 | 102.0 | 102.5 | 102.3 | 102.3 | Nil. |
| | No. 2 | 103.0 | 102.3 | 102.6 | 101.5 | 101.5 | 102.0 | 101.7 | 1.1 fall |
| Second Test—May, 1898 ... | No. 1 | 102.2 | 103.0 | 102.6 | 100.6 | 101.0 | ... | 100.8 | 1.8 fall |
| | No. 2 | 101.3 | 101.6 | 101.4 | 101.9 | 101.5 | ... | 101.7 | 0.3 rise |

* Two more of the non-re-acting cows of this herd have been slaughtered and carefully examined since the text of this report was written, and not the slightest trace of tuberculosis could be found.—S.S.C

It will be seen from this table that no indication of tuberculosis could be drawn from the temperatures, and there was no other sign of a re-action. Particulars concerning the life history and *post-mortem* examination of these animals are as follow :—

No. 1 Cow.—A six-year-old half-bred Shorthorn cow, recently calved, in low condition, but an excellent milker. Two years previously she had had an attack of acute pleurisy, but recovered after 14 days' veterinary treatment. On being slaughtered, the respiratory, digestive, circulatory, urinary, and generative organs were carefully examined and minutely dissected, as also were the various groups of lymphatic glands, the supra-renal capsules, and the brain and spinal cord; and with the exception of a fibrous pleuritic adhesion about 3 inches in diameter, evidently the remains of the acute pleurisy, no lesion, tubercular or other, was found.

No. 2 Cow.—An aged Shorthorn cow, in full milk and good condition. No previous history of serious illness, but selected by the manager as the most likely of the others to be diseased on account of occasional capriciousness of appetite and attacks of foetid diarrhoea and indigestion. A similarly complete and careful *post-mortem* examination of this cow was made, with the result that no tubercular lesion was found. The liver was, however, somewhat extensively diseased, being affected with both fluke (*Distomum hepaticum*) and parasitic cysts. A number of the ducts of the liver had undergone calcareous degeneration, and contained the calcified *débris* of flukes, but no living fluke was found. In the substance of the liver were many parasitic cysts, the contents of not a few of which had undergone degeneration, the wall or capsule of each cyst being, however, well defined and shrivelled, and without sign of coalescence.

[Another case,* which affords evidence that when tuberculin gives a negative result tuberculosis is not present, has recently been investigated. In the course of the *post-mortem* examination of calves used for the cultivation of calf vaccine lymph I found a twelve-weeks-old calf badly affected with tuberculosis, the parts most diseased being the lymphatic glands (especially the mammary or udder, inguinal or groin, bronchial and sternal groups), the lungs, pleura, and liver. There was also a large broken-down tubercular abscess at the umbilicus (navel). Although the fact that the disease was generalised in so young a calf might have led to the supposition that it had been contracted from the dam, the calf having sucked up to the time of killing, the further fact that the alimentary canal did not show the least trace of any tuberculous lesion seemed to negative such a supposition. On the other hand, seeing that the lesions in the udder and groin lymphatics, which drain lymph from the region of the umbilicus, were apparently of greater age than those in other parts of the body—those in the lungs and liver being apparently recent, while those in the pleura were in quite an initial stage—it appeared that the disease had progressively invaded the lymphatic glands situated between the umbilicus and the outlet of the main lymphatic duct into the blood stream, whence the lungs, liver, &c., ultimately became affected; and I concluded that the disease had been contracted by inoculation at the umbilicus (shortly after birth, and possibly before the wound caused by the severance of the umbilical cord had properly healed), probably through the calf lying on tubercle-infected litter, *débris*, or other matter. The dam of the calf, about 3 years and 3 months old, was then tested with tuberculin. The test gave a negative result, there being no rise of temperature or other symptom of a re-action at any time after the injection. The chairman then decided to have a bacteriological examination (for the tubercle bacillus) of the milk of the cow, of the vaccine lymph yielded by the calf, and of the tubercular lesions of the calf. The examination was made by Dr. Cherry,

* The animal tested in this case is not one of the 267 cattle mentioned at the outset of this report.

of the Melbourne University, and his report states that the results were negative in the case of the milk and lymph, but that typical tubercular structure and tubercle bacilli were found in the lesions. The negative result of the tuberculin testing of the cow, so far as her milk was concerned, was thus confirmed by independent bacteriological examination.]

To resume, it is to be observed that in the course of the somewhat limited inquiry, the results of which are given above, every animal that re-acted was proved to be tuberculous; and that, positively in the cases of two non-re-acting cows, and presumably in the case of the remaining 241 non-re-acting cows, no tuberculosis existed.* When tuberculin indicated that tuberculosis was present, tubercular lesions were found; and when tuberculin indicated that tuberculosis was not present, tuberculosis was not found. This result is in accordance with a vast amount of experience obtained in other countries; and it may with confidence be said that there is substantial ground for the formulation of the axiom "Tuberculin cannot lie."

S. S. CAMERON, M.R.C.V.S.,
Veterinary Inspector.

16th March, 1899.

* The numbers 2 and 241 obtained at the time of writing the text of this report become, by reason of the facts set out on page 79 in a footnote, 4 and 239 respectively.—S.S.C.

Tick Fever.

OBSERVATIONS ON TICKS AND TICK FEVER AT THE INDOOROOPILLY EXPERIMENT STATION AND AT ST. HELENA.

By C. J. POUND, F.R.M.S.
Director of the Queensland Stock Institute.

HISTORY OF THE TICKS AT INDOOROOPILLY.

THE first ticks in the Indooroopilly paddocks were discovered on the 14th November, 1898, on several uninoculated young steers (out of a lot of 12 animals) just after arrival from the Rosewood district. It must not be overlooked, however, that ticks had been discovered on cattle and sheep in numerous places in and around Brisbane some months previous to this; and further, I may point out that the Indooroopilly paddocks are on the road along which hundreds of cattle and sheep pass from the Enoggera saleyards to the slaughter-yards at Moggill.

From November last to the present time four distinct generations of ticks have been observed on the cattle. During this period no animal has been grossly infested with ticks. Although the animals are handled several times every day, and are extremely quiet, the largest number of mature ticks found at any time on any one animal (even on the most favourable parts—viz., under the forearm, inside the thigh, &c.), would not exceed 100, the explanation being:—

- (1) That the greater majority of the ticks, as they matured, were readily picked off by the fowls, which are continually following the cattle about, and
- (2) That, the vegetation being extremely sparse, quantities of the ova and larval ticks must have been destroyed by the action of the direct sun's rays.

INOCULATION OF TICK-INFESTED CATTLE.

The above-mentioned uninoculated steers from Rosewood, although tick-infested and running in the same paddock with the inoculated cattle, had remained free from natural tick fever; and it was thought that, as they had shown no symptoms of sickness or elevation of temperature, they might have acquired immunity gradually. In order, however, to test this, 8 of the animals were, on different occasions, inoculated with proved recovered blood; and in every instance each animal gave a distinct temperature reaction, and recovered within the usual period of three weeks.

At the present time one of the remaining uninoculated steers has developed symptoms of natural tick fever; but being a young animal it is highly probable that he will recover.

PARTICULARS OF THE FOUR UNINOCULATED AYRSHIRE COWS.

On 1st September, 1898, I tested with tuberculin the whole of the St. Helena herd. Of the 9 animals that reacted 5 were at once destroyed, while 4 of the best Ayrshire cows, being in calf, and only having tubercular disease in an incipient form, were immediately removed to the Indooroopilly Experiment Station several months before ticks were introduced to the island for observation and experiment. Each cow calved in due course, and the calves were at once taken back to St. Helena, while the cows were kept in a special paddock with a pure-bred Shorthorn bull, also affected with tuberculousis.

Considering that there is a great amount of daily traffic backwards and forwards through the various paddocks and enclosures at Indooroopilly, it was not long before ticks made their appearance on the St. Helena cows. Moreover, it is only reasonable to expect that the progeny of ticks from the inoculated cattle and the Inkerman steer attached themselves to and matured on the uninoculated cattle, and *vice versa*. The inoculated cattle and the immune Inkerman steer were specially kept for supplying blood, during the last two years, for general inoculation purposes between Gladstone and the New South Wales border.

A FATAL CASE OF ACUTE (NATURAL) TICK FEVER.

The 4 uninoculated Ayrshire cows remained in excellent condition, but, although they have never been free from ticks, the latter were never very numerous; in fact, more often than not, they were detected with difficulty, unless they were subjected to a crush examination.

The results obtained from the inoculation of the Rosewood steers proved it was quite evident that the 4 Ayrshire cows were still susceptible to the fever, whether produced artificially by inoculation or naturally by the ticks.

On Sunday, the 28th May last, one of the cows, named "Annie," after being tick-infested for over 7 months, appeared somewhat drowsy.

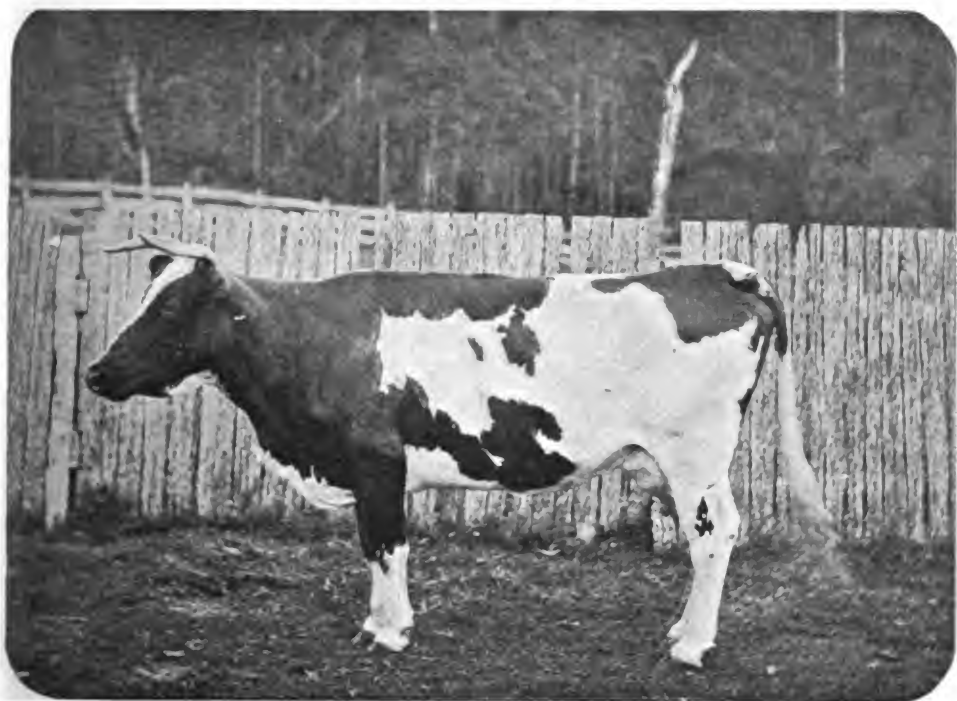
31st May, the temperature began to rise.

1st June, exhibited evident symptoms of sickness, standing about alone invariably in the shade.

2nd June, became worse, refused to eat and ceased chewing the cud; then laid down with head stretched forward near the ground, the ears drooping, and a noticeable staring coat. In the afternoon she became worse, the dung being very hard and pelleted, while the urine was distinctly red in colour.

3rd June, about 6 a.m., she laid down and struggled slightly, and then commenced to bellow and roar tremendously for about 10 minutes; the temperature, which had been standing at 107 degrees F., gradually sank to 96.3 degrees F.—*i.e.*, 5 degrees below the normal—after which she died.

Plate CXX.



AYRSHIRE COW, "ANNIE."
Taken Ten Days before Dying of Acute Tick Fever.

POST-MORTEM EXAMINATION.

The carcass was well nourished and fairly fat. The muscular tissue of the fore and hind quarters was anæmic. The appearances of the internal organs were as follows :—

Heart—The outer muscular tissue had its smaller vessels and capillaries dilated.

Lungs—Congested.

Liver—Very much enlarged and friable, and of a dark-yellow ochre colour.

Gall-Bladder—Walls fully distended ; several small petechiæ on mucous membrane.

Bile—Enormous quantity, very thick, granular, and almost black.

Spleen—Greatly enlarged, almost three times normal size ; substance tarry and in consistence like black currant jam.

Urine—The bladder was very much dilated, and contents resembled very dark port wine ; in fact, it was almost black.

Stomach—The food in the stomach was impacted, especially in the third and fourth stomachs.

Intestines—The fæces in the rectum were very hard.

TUBERCULAR LESIONS—The only visible lesions of this disease were: Several tubercles (each about the size of a walnut) in the substance and on the dorsal surface of the right lung ; and a mass of tubercular nodules on the inner lining of the right ribs. The other organs and lymphatic glands throughout the body were apparently free from the disease.

A most conspicuous feature about the tubercular lesions was the colour, which, instead of being almost white and free from blood, was of a very dark-red in consequence of the intensely congested state of the bloodvessels. This pronounced state of congestion is invariably present in all new growths found in the thoracic and abdominal cavities of an animal dead of acute tick fever ; this is brought about by the extremely fine calibre of the capillaries, which is only sufficiently large to allow a normal red blood corpuscle to squeeze through, but during acute fever the bloodcells, containing one or more of the pyrosomum micro-parasites, cannot be forced by the blood pressure through the vessels, which gradually become congested, resulting in what appears to be a mass of emboli plugging the capillaries.

GENERAL REMARKS.

The above facts apparently throw much light on the vexed question, "Is inoculation responsible (where ticks are present) for the introduction of tick fever amongst uninoculated susceptible cattle?" Theoretically, and in my opinion, the answer should be in the affirmative, for the simple reason that the nature and symptoms of the disease produced naturally and carried on through successive generations by the ticks are precisely the same in every detail as the fever produced and carried on continuously by means of subcutaneous or intravenous inoculation of recovered or virulent blood.

No one will dispute the fact that the disease in its severest form was spread from the Gulf country in 1895-6 right across to Townsville, and from thence to the Lower Burdekin, naturally by ticks, as the system of preventive inoculation for tick fever was at that time practically unknown. Moreover, it was observed that in some cases the disease appeared soon after the arrival of the tick ; while in others, although a mild and unnoticeable form of the fever may have existed, no deaths or severe attacks of the disease were perceivable until the ticks had become established in the district for over 12 months, and in exceptional cases for nearly 2 years. This can only be explained in what I believe to be an alternation of generations of the micro-parasite, which, alone and in a certain form only, is capable of causing acute fever by the rapid multiplication of its species in this stage, and a correspondingly speedy invasion and destruction of the red blood corpuscles.

This complex process of the alternation of generations of the micro-organisms of tick fever has been engaging my attention for some considerable time, and from my observations I feel more and more confident that this is the only satisfactory explanation why there are so often long periods of time intervening between the first appearance of ticks and an outbreak of the disease, and also why the disease suddenly disappears and subsequently reappears with the same amount of virulence at a later date. In other words, although tick-infested cattle have the micro-organisms in their blood, and all ticks carry the micro-organisms, which are transmitted through the ova to the larval tick, it does not follow that these micro-organisms are pathogenic. This has been proved repeatedly as a result of the examination of blood of long tick-infested cattle at Mount Cornish, Boolburra, and other centres, where the organisms in certain stages were extremely numerous, but without causing any apparent injury to the elements of the vascular system. The reproduction of these non-pathogenic forms may go on through a great many successive generations—first through the tick, then through the cattle, and so on backwards and forwards until a time arrives when some of the cells (organisms) club together and form, as it were, gemmules, from which the red corpuscle-destroying form of micro-parasite is developed.

EXPERIMENTS IN PROGRESS WITH THE VIRULENT BLOOD TAKEN FROM THE DEAD AYRSHIRE COW.

In order to ascertain—

1. How long immunity will last after recovery from natural tick fever ;
2. For what period an animal will remain immune after recovery from inoculation with recovered blood ;
3. Whether a calf, whose blood immediately after birth produced severe tick fever when injected into a number of healthy cows, is immune to the effects of an injection of virulent blood ;

the following animals each received a hypodermic injection of 10 c.c. of blood taken from the dead cow "Annie":—

One of the original Inkerman steers that was obtained from North Queensland in February, 1897.

Two cows that had recovered over 2½ years from natural tick fever, and were sole survivors of a dairy herd that had all died from acute fever.

One heifer that had been inoculated direct from the original Inkerman steer in February, 1897 (2 years and 4 months ago).

One Shorthorn bull that was inoculated from an animal, the fifth remove from the Inkerman steer.

One heifer calf, 3 months old, uninoculated, but born of the heifer (referred to above) that had been inoculated over 2 years.

NOTES ON TICKS AND INOCULATION AT ST. HELENA.

At St. Helena we have the most conclusive evidence that the first ticks that got on to the cattle were the progeny of ticks that matured on sheep which, coming from tick country, were taken down to the island about 8 months ago. Two months later, on 13th January, all the cattle, with the exception of twelve milking cows, were inoculated. On 28th March, the animals which had been previously operated upon were again inoculated, together with six of the uninoculated milking cows. The remaining six uninoculated cows have since been freely mixing with the inoculated cattle, and ticks have been and can always be found on every animal in the herd ; yet, strange to say, up to the present time, not one of the uninoculated cows have shown the slightest symptoms of fever or sickness, nor has any diminution occurred in their milk supply. If, however, tick fever should develop among the uninoculated animals, the case will be much more interesting than the Indoeroopilly one, from the fact that we are certain that before the first ticks attached themselves

to any of the cattle, their parents had matured on an unnatural host—the sheep—which is naturally insusceptible to tick fever; therefore this break in the line of descent might possibly cause the tick to lose its pathogenic properties; and, if this be correct, then the disease can only be caused by ticks which are the progeny of those from inoculated animals, unless, of course, the tick has some unknown properties of acquiring its pathogenic micro-parasite from external nature. In consequence of several unforeseen obstacles, it has never yet been proved experimentally whether ticks matured on sheep retain or lose their power of conveying, through their progeny, tick fever in any form to healthy susceptible cattle.

With reference to the inoculation of the St. Helena herd, I may mention the following interesting facts which are worthy of consideration of every dairy farmer: Over 70 animals were inoculated twice, the second inoculation being with blood which has never been known to fail for the past two years. The results of the two operations were as follow:—

1st Inoculation (13th January, 1899).—Outward symptoms of fever very slight; no temperatures taken. Of 12 cows in milk, there were only a few that showed a noticeable diminution in the milk yield.

2nd Inoculation (28th March, 1899).—No apparent signs of sickness throughout the herd, except 2 animals—a young heifer and a ten-year-old cow; the latter animal became very sick, refused food, ceased chewing the cud, and went completely off her milk for several days, but eventually recovered, and in due course her normal supply of milk returned. It is only fair to state that the recovery was probably enhanced by the fact that during the fever stage this cow received nothing but diet of a laxative nature, such as bran-mash, linseed-meal, and fresh green feed, also an occasional drench of castor oil.

The cattle inoculated at St. Helena consisted of—

1 Six-year-old bull.

10 Yearling bulls.

30 Cows, 12 of which were in milk, and the majority in various stages of pregnancy; none of these aborted.

30 Heifers and calves.

In my opinion the success of the inoculation of this herd was due to the following facts:—

- (i.) On each occasion proved reliable blood was used.
- (ii.) The process of inoculation was conducted steadily and quietly.
- (iii.) Most important of all, after the operation the animals were (as they always have been) treated kindly.
- (iv.) No fast driving was indulged in.
- (v.) Whips and dogs are never used in bringing the cattle to the milking yards.
- (vi.) The animals are milked regularly to the minute, every night and morning.
- (vii.) The animals have free access to a plentiful supply of fresh clean water.
- (viii.) The feed is more or less green, and altogether of a laxative nature.
- (ix.) Up to the present time (20th June) no natural tick fever has made its appearance among the St. Helena cattle.

A paragraph lately appeared in the *Courier* to the effect that four inoculated cows from St. Helena were removed to the Indooroopilly quarantine grounds. This is a misapprehension of facts, the cows not having been inoculated before removal.

CHRONIC FORM OF TICK FEVER AT INDOOROOPILLY.

Two of the animals inoculated some 10 months ago had never regained their normal condition; each became gradually emaciated and extremely anemic, and ultimately died of chronic tick fever. Had these animals been grossly tick-infested, there can be no doubt that many persons would attribute their deaths to "tick-worry" or "tick-poverty," in consequence of the ticks sucking out the greater part of their blood. As a matter of fact, as previously stated, ever since ticks have been in the paddocks, not one of the animals has been grossly infested—the greatest number of ticks that could at one time be picked off any animal would not exceed 100.

Another point of interest in connection with these chronic cases is that they were never in a good enough condition to draw blood from.

In contradistinction to these cases, there are some 20 animals (steers and heifers) all of which have completely recovered after suffering from an extremely severe attack of acute fever produced by inoculation, and which for the last 12 months have been continuously used for drawing blood from for inoculation purposes. Some of these animals have had as much as 400 oz.—equal to $2\frac{1}{2}$ gallons—of blood taken from them, and yet they have remained perfectly healthy and in good condition.

RECOMMENDATION.

The observations at Indooroopilly clearly prove that our winter months will not check the spread of the ticks or their accompaniment—tick fever. Moreover, considering the numerous tick centres in Southern Queensland, and the many thousands of cattle that are still uninoculated in close proximity to these different centres, I am of opinion that every encouragement should be given to dairy farmers, graziers, and stockbreeders to have their cattle inoculated with as little delay and inconvenience as possible, and in a thorough and systematic manner. This can only be properly accomplished when the work of inoculation is under Government supervision. Therefore, considering that the process of preventive inoculation for tick fever (as initiated by me) has, wherever my instructions have been strictly adhered to, resulted in such an unqualified success, and where my directions have not been followed frequently resulted in failures, I sincerely request that you will urge upon the Minister the necessity of having this work pushed forward immediately in order to prevent the recurrence of such heavy losses as have occurred at Townsville, Mackay, Bowen, and Rockhampton before the system of preventive inoculation was introduced.

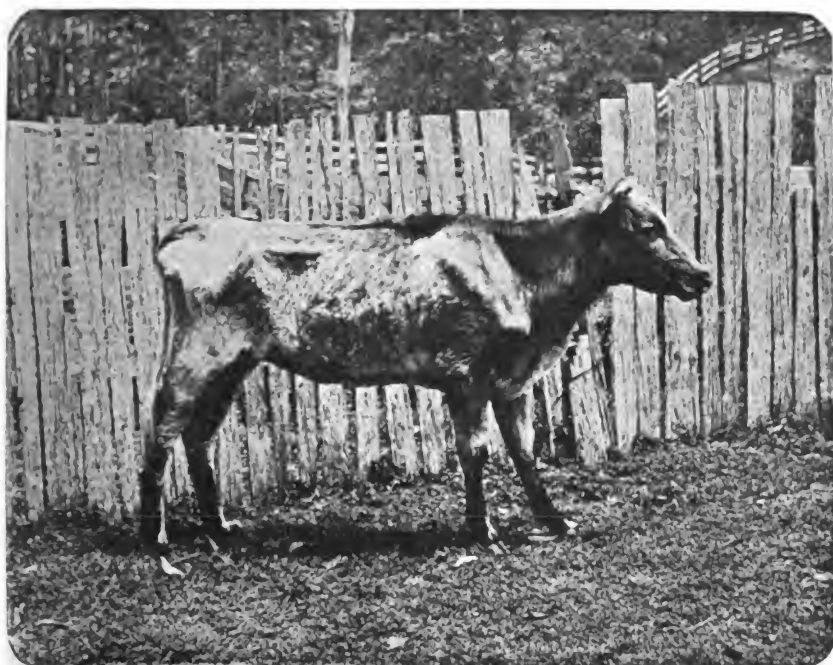
INOCULATION AS A PREVENTIVE OF TICK FEVER.

MR. FANSHAWE GOSTLING, Manager, Gin Gin Station, writes to the Chief Inspector of Stock, as follows:—

Gin Gin Station, 17th April, 1899.

According to a request contained in your letter of the 5th April, I have the pleasure of submitting to you my observations gained from a purely practical source on the effects of inoculation as a preventive of tick fever. To do this I cannot do better than give the history of the tick from the time it was first discovered on Gin Gin up to the present. I might state at once that I am a firm believer in inoculation; and late as I started operating on the Gin Gin herd, I have, to my mind, proved it to be a success. I have inoculated about 6,000 head of cattle, and my notes were carefully made as each mob was operated on. When I say, "Late as I started," I wish you to understand that, like everybody else, I waited for the tick to come instead of inoculating before it made its appearance. My loss, when compared with that suffered on many other places, is small, and I feel certain that, had I taken the advice given me by Mr. Pound and inoculated before the tick came, my loss would have been less.

Plate CXXI.



SHORTHORN HEIFER.

Taken Ten Days before Dying of Chronic Tick Fever.

I will deal with the question of inoculation under five heads—

- A.—A few well-authenticated instances in my own experience of the efficacy of inoculation as a prophylactic.
- B.—The average mortality resulting from the inoculation of young cattle up to 2 years of age.
- C.—The average mortality from the operation in aged cattle—cows only.
- D.—The urgent necessity for careful treatment, or, in other words, the absolute necessity of leaving stock undisturbed for at least a month after inoculation.
- E.—Mortality amongst pregnant cows, or their inclination to abort from the effects of the operation.

HISTORY OF THE CATTLE TICK ON GIN GIN.

The first ticks noticed on any of the Gin Gin herd was on the 1st June, 1898. They were found on the milking cows, and were about a fortnight old.

On the 2nd June a stud heifer in good order and in calf with her first calf died. I had the cow opened, and found marked symptoms of Texas fever. The bladder was full of redwater; the gall granulated, very much resembling thick pea-soup; and the spleen was quite rotten. I sent some blood down to Mr. Pound, who reported, under date 20th June, that he had found the micro-organisms of tick fever. I at once put the stud cattle through the yards, and found ticks on all of them.

The first cattle inoculated were operated upon on 17th May, 1898, when to the best of my belief there were no ticks on the run. All these cattle showed signs of fever about 14 days after inoculation. None died, and they are all alive to-day and in healthy condition, although ticks are plentiful on them.

A.

On the 23rd and 24th May, 1898, 216 head of mixed cattle were operated upon, from newly branded calves of a month old up to very old cows, a few of which, by the number on their hide, were 15 years old, these cattle having been tailed for 3 weeks before being operated upon—owing to their being inclined to be wild—were still kept in hand during the day and put into a small paddock at night, and were so handled until the 18th June, when they were square-tailed and let go on their run. The loss was 3 head out of the lot of 216, and although ticks are fairly numerous on these cattle to-day they are healthy and in A1 condition. Only one cow slipped her calf. The 3 head that died were cows— young heifers with their first calves; none of the very old cows died, although they got sick.

On the 11th June the balance of the stud cattle, 35 head, all ages, were inoculated, and none died, although most of them were sick. These cattle are alive and healthy-looking to-day, and fairly infested with ticks. This makes a total of 52 stud cattle operated on without a loss; 14 bush cattle were inoculated at the same time as the 35 head, and put in the same paddock; 3 head were also left in this paddock uninoculated, and they all died—*i.e.*, the uninoculated 3.

On the 9th January, 1899, 350 head of mixed dairy cattle belonging to a selector were inoculated, and 16 died from the operation. When I last saw these cattle about a month ago, they were in splendid condition in spite of their having ticks on them. These cattle were put into three paddocks, and all the deaths, with the exception of one, occurred in one paddock. The owners of the cattle told me, a few days ago, that several cattle had died lately in the paddock where only the one beast died from inoculation, which seems to point to the fact that the operation did not react amongst the cattle in this paddock so well as in the others. I might state here that I sent 2 immune calves out to draw the blood from, the calves having been previously inoculated with 5 c.c. of virulent red-water blood. One of these calves is now on Kilkivan Station for experimental purposes.

On the 21st February, 1899, about 200 head belonging to different owners were inoculated, and the loss was very heavy, running up to 40 per cent. This heavy loss will be touched upon in Paper D.

On the 23rd March 51 head of mixed dairy cattle were operated upon for a selector, and his loss was 2 head. This mob will also be touched upon in Paper D.

On the 30th January, 1899, Mr. Tidswell, of Walla Station, sent me over 6 cows and calves that I might inoculate the calves, about 6 months old, for the purpose of obtaining immune blood to inoculate the Walla herd. The ticks were bad on Walla at the time. These cows and calves arrived late on the 30th January, and left again about 4 o'clock in the afternoon of 31st. With these cattle I sent over a Gin Gin stud cow and calf, both inoculated, and a Walla steer that had been running in the same paddock as the Gin Gin cattle for over a year. The steer was uninoculated, and, 14 days after leaving Gin Gin, 3 Walla cows and the steer died from red-water, and the Gin Gin cow was not a bit the worse for the journey, which was over 12 miles.

On another occasion, a man living in the Gin Gin township lost 22 head out of 35, and getting frightened he asked me to inoculate the balance, which I did. They all reacted; some got very sick, and 1 died from the operation. This was done over three months ago; and, although the 12 head left have since been pretty well infested, they are healthy-looking to-day. The only bullock-team to be seen working at Gin Gin is owned by a man, who, as he himself put it, "would just as soon see the bullocks die from inoculation as from ticks." I inoculated all his bullocks that he could get together—17 head—out of which 4 died. Some of them were old animals, and all had ticks on them. This team now consists of 13 I inoculated, 2 naturally recovered, and also 1 operated on at Monduran. They are covered with ticks, look well, and work steadily. Another man, who insisted on working his cattle without inoculating, lost all but 5 out of 16 in a fortnight. I could give many other instances of the value of inoculation, but think the cases I have quoted are sufficient to convince the most sceptical that inoculation is a prophylactic, and it is well worth risking the loss of a few head by performing the operation—until something better is discovered—than not so to do, and lose 50 per cent. of the herd from ticks.

B.

The average mortality amongst young cattle up to 2 years old in both sexes is not worth mentioning, provided that cleanliness, care, and common sense are used. I quote as examples the 17 young stud cows operated on on the 17th May, 1898, the balance of the stud cattle on 11th June, and the large mob (216) on 23rd and 24th May, amongst which there were many young cattle. All these cattle have been under my eye, and I have never seen a young calf dead—under 6 months old—from inoculation. I have, however, seen several young cattle on the run, about 18 months old, that have died from Texas fever, but whether set up by inoculation or by the tick itself I cannot say, as these cattle had ticks amongst them, and the disease was prevalent when I operated on them. If, however, young cattle are taken in hand before ticks appear, I am certain the loss will not be 1 per cent. More young cattle are killed by rough usage, bad blood, and dirty instruments than from the consequence of inoculation itself.

C.

The question as to the average mortality from the practice in aged cattle I can only deal with so far as cows are concerned, as I inoculated no old or aged males older than No. 4—excepting the few working bullocks mentioned before; and although I have done a good many Nos. 4 and 5, I cannot write with absolute certainty as to the loss, as many were turned out into the bush, and some got into large paddocks of 6,000 acres; but going by the number seen dead, I am pretty sure I am well within the mark when I quote 5 per cent. as the loss. I can, however, speak with certainty as to the loss amongst females, and refer you to my remarks on the 216 head inoculated on the 23rd and 24th May,

where the loss was 3 head, all cows. I cannot give you the exact number of cows in this mob of 216, but know there were over 100. With careful treatment and good blood, I am of the opinion the loss will not be more than 5 per cent.

D.

The necessity for careful treatment by leaving cattle severely alone after inoculation cannot, in my opinion, be better shown than by drawing your attention in Paper A to the cattle treated on the 21st February (200 head) and 9th January (350 head). The same calf was used on both occasions to draw the immune blood from. I took the calf out to the 350 head, but made the owners of the 200 head bring their cattle into the station yards, a distance of about 8 miles, and they had to be driven back again. These cattle had a few ticks on them when they came, but they picked up a great number along the road. The comparative results were a loss of only 16 head out of the 350 operated on in their own paddocks, and 40 per cent. in the 200 which were brought to the station yards. I find, on looking up my notes, the actual number in this lot was 177, made up as under—

| | | |
|---------|-----------------------|-------|
| (a.)—51 | head inoculated, lost | 14 |
| (b.)—25 | “ “ “ | 5 |
| (c.)—35 | “ “ “ | 14 |
| (d.)—19 | “ “ “ | 1 |
| (e.)—47 | “ “ “ | 7 |
| <hr/> | | <hr/> |
| 177 | | 41 |

Such a mortality as this naturally made me most anxious to discover the cause. I was asked by a selector, living close to the owners of the above cattle, to operate on his cattle, so used the same calf again with the result as stated in Paper A; but on this occasion sent the calf down to the cattle to be operated on. We have therefore three separate mobs of cattle inoculated from the one calf, the heaviest loss being among the lot that were driven about after the inoculation.

E.

The report as to the mortality and inclination to abort amongst pregnant cows, I am unable to substantiate. I have made the most careful inquiries amongst the dairy people whose herds I have inoculated, and can find no single case where such has happened; and in my own case amongst station cattle mentioned as being tailed (216 head), only one case was seen. Off camps inoculated in June and July, 1898, I branded up a healthy lot of calves in the following January in number equal to my previous year. It is true that in one case not far from here the number of cows that slipped their calves after inoculation was very heavy, but as I had nothing to do with this lot I only mention the fact. Amongst the Gin Gin stud cows 15 to 20 calves were dropped a fortnight after the operation, and they can all be seen to-day with their mothers. The mere fact of putting a cow fairly heavy in calf through a crush, even without inoculating her, is sufficient to cause abortion. The operation should, therefore, be postponed until after calving if possible. I have inoculated over 400 dairy cattle, and know of no single instance of a greater mortality amongst pregnant cows over any other ordinary cattle.

After a careful study of the whole question, I am certain the loss from inoculation can be put down at the outside at 5 per cent.; and if cattle are treated before the tick comes, the losses will be less. Had I known as much a year ago as I have learnt since, the Gin Gin herd would have all been inoculated before the arrival of the tick. A great many theories have been put forward as to how the tick crossed the quarantine line when fixed at the Boyne River. In my own mind I blame the sheep that travelled overland from Gracemere; the worst places for ticks on Gin Gin were the spots the sheep camped on.

General Notes.

TO RAISE EARLY POTATOES.

A VERY interesting experiment was made at the Queensland College last year with seed potatoes. A quantity of seed was kept in a shed under straw until the planting season came round. They were then carefully sorted, all those which had not well sprouted being rejected. Some unsprouted seed was sown fully 2 weeks before that which had sprouted. When the former appeared above the ground as a straggling crop showing a very large percentage of misses, the latter were already fit for earthing up, and there was scarcely one miss per acre.

We have seen it recommended that to secure an early crop, the seed should be kept in boxes in sand, where the potatoes will sprout much sooner than when left on the barn floor. Both this and the method given above will ensure early sprouting of the tubers.

THE BEST MANURE FOR POTATOES.

SIXTEEN tons of stable manure per acre will produce a larger crop than the most remunerative dressing of artificial manures. But employ a mixture of 8 tons of stable manure and 3 cwt. of nitrate of soda, or an equivalent quantity of sulphate of ammonia, and a far greater yield will be obtained. In fact, such a dressing gives the greatest yield and most remunerative results of any. Any artificial dressing for potatoes (if stable manure is unavailable) should contain nitrogen, phosphorus, and potash. Omit one of these, and the result will be a poor crop. The omission of nitrogen will cause the greatest loss, and that of potash the least.

BLUESTONE.

THERE is no reason why farmers should allow themselves to be imposed upon by any unscrupulous vendors of bluestone for pickling wheat. The true "English" bluestone is hard, has a crystalline fracture, and is of a deep-blue colour. Some "colonial" bluestone is of a pale-blue, or green, or even whitish colour. It is soft, and is of little or no value for pickling seed wheat. It is not bluestone at all; it is merely copperas or greenstone—that is, sulphate of iron.

SUGAR PLANTATIONS IN CUBA.

SOME of these Cuban places were of princely size and equipment. Near Matanzas there is a finca belonging to a gentleman named Mendoza. Standing on his front gallery, he pointed to a hill 15 miles away, and remarked that all the intervening country was his, and the green on that distant hillside was his cane, and beyond were other fields—all his. Near Baracoa is a plantation where the fields stretch for 10 miles on either side of the sugar-house. This place, in spite of its great length, is only 4 miles wide, and the owner says he planned the shape of the fields so that this would result; and by planting it in twelve sections, beginning at one end and sowing each section a month or so later than its predecessor, he has secured a constant progression of maturing cane. Month by month his crop ripens, and month by month he cuts it off and takes it to the mill. His estate begins to grind about December or the early part of January, and continues till November. The grinding term here corresponds, approximately, to that observed on the Havemeyer plantations, where the mills really stop grinding only because the supply of material is exhausted. These places sometimes make as much as 50,000,000 lb. of sugar per annum. One of them is equipped with three sets of triple effects, and has a crusher, besides nine rollers. The larger places use about 3,000 tons of cane per day.

These, at least, were the figures which applied previous to the war. Taking an average of the yield of all the plantations of the island for that time, the yield was about 10,000 or 12,000 tons of sugar per annum. But now the average will not exceed 2,000 or 2,500 tons each.—*Louisiana Planter*.

THE FIRST PIG IN SCOTLAND.

THE Scotchman eats less pork than the Englishman. The first pig known to Scotland was a gift to a gentleman in Dumfriesshire. He was named Gude-man o' the Brow. One day he got out [the pig, not the gentleman], stayed out over night and scared the whole parish of Carlavroe nearly out of their senses. They prayed for mercy, and thought Old Nick had come to town. He rooted around quietly unmindful of the consternation he was spreading. Then the Scot turned on him, chased him to a standstill and hay-forked him to death. This was in 1720. Hogs are not taken so seriously now, and not eaten much.

AMERICAN BACON AND CATTLE IN ENGLAND.

MR. LATHROP, United States Consul in Bristol, England, in a report to the United States Department, says:—

The United Kingdom imported, in 1897, 5,000,000 cwt. (560,000,000 lb.) of bacon, of which 1,000,000 cwt. came from Denmark and 3,500,000 cwt. from the United States. For our great share in this enormous business, we were content to accept from 4 to 6 dollars per cwt. less than was paid for English, Danish, or Canadian bacon. This great loss was due to the inferior quality of our product and unsuitability to consumer's taste, and it seems to me that it would be worth somebody's while to cater specially for the British market. It will not pay the farmer in the corn belt to do this; it will not pay the great packer, who throws his surplus across the ocean to bring what it can; but why it will not pay in Wisconsin or Minnesota or New York or New England, I cannot understand. If Canada can get 15 dollars per cwt., why should not we, instead of 8 or 9 dollars? They only ship 300,000 cwt. per year from Canada, but they get top prices for that. Let us see how. In the first place, their packers demand a hog that costs more to produce than ours; so they pay more for it, paying a premium on the best—say 4.75 dollars (per 100 lb.) for a pig under 160 lb., and 4 dollars for one over that weight. These hogs are fed mostly on peas, which make as firm and fat flesh as the usual English food, barley meal or miller's offal; and even a small ration of corn is objected to. Canadian packers regret that the Canadian Government has put corn on the free list, as they say that the temptation to feed a small ration of corn is now almost irresistible, and that the result is deterioration in the bacon. With the right hog once secured, the basis of success is reached, and it is astounding how soon, in Canada and Denmark, the proper hog appears after the establishment of the packing-house.

The next matter of importance is the mode of cutting up, and this is not so simple as it seems. I know of one Canadian house, whose brand is now well and firmly established in England, who made mistakes until an expert crossed the water and showed them how to cut a "Wiltshire singled side."

COCKY CHAFF.

Cocky chaff, by which is meant the husks of wheat after threshing out the grain, contains a considerable amount of nutriment, and hence possesses a certain feeding value for stock; in fact, there is very little difference between the nutriment contained in wheaten straw and that contained in the husks. According to analyses made by Mr. A. N. Pearson, Government Chemist for Agriculture in South Australia, oaten straw contains 25 per cent. more nutriment than either cocky chaff or wheaten straw in the way of heat and fat production, and is nearly four times as rich in digestible flesh-formers.

DEPTH FOR SOWING SEEDS.

PROFESSOR VOLLNY recommends the following as the outside depths at which certain seeds should be sown:—For wheat, rye, barley, oats, &c., from 1 inch to $2\frac{1}{2}$ inches; for millets, from $\frac{3}{4}$ -inch to $1\frac{1}{4}$ inches; for maize, from 1 inch to 2 inches. If the plants germinate from a greater depth, they are more liable to be attacked by fungoid diseases.

PANICUM COLONUM.

MR. H. FITTELL, of Eel Creek, Gympie, writing on the subject of *Panicum colonum* mentioned by Mr. H. Tardent, and described by the Government Botanist, Mr. F. M. Bailey, in Vol. IV. (p. 364) of the *Journal*, has kindly supplied the following further information about this fodder plant. He says:—"I wish to inform you that I have plenty of the same kind of grass on my farm. It came first with the lucerne about 5 years ago, and grows very luxuriantly on rich sand. I have seen it 4 or 5 feet high. It makes good fodder, coming next to Prairie grass in my opinion. I have a small stack of it now, and the cattle are very fond of it. It will yield two cuttings—one in March, and a second in May. I cut mine in March; but the weather has been very dry ever since, so that it is very short this time, but still full of seed. I have about 10 lb. of seed on hand. It should be mentioned that the grass will stand any amount of water on it."

[This confirms Mr. Bailey's account of the grass. He said, "It would require a good and *probably damp soil*."—Ed. *Q.A.J.*]

HONEY FROM CANE-JUICE.

WILL it be believed by our beet-men that honey derived from pure cane-juice is unsaleable? Yet such is the statement made in the *California Fruitgrower*. The bees in Cuba (the paradise of beekeepers) have been making honey from the burnt cane plantations, which is nothing more than evaporated cane-juice. The plantations were burnt, and the canes broken. From the cracks the juice exuded and candied in lumps. The rains softened this thickened sap so that the bees could secure it, and they filled their hives with it. A certain individual secured 700 gallons of this pure cane-honey, and it was so pure, and its purity so evident, that he could find no sale for it. The Cuban bees extract honey from the bell flower, which is really the most delicious product of the bee made anywhere, but the stand-by of the Cuban beekeeper is the royal palm, which blooms every day in the year, and almost drips nectar. This the bees gather all the year, except for about 90 days during the rainy season, when the honey is washed out of the flowers, and the bees must be fed. This honey is about the colour of molasses, and not much better to eat.

FORESTRY IN WESTERN AUSTRALIA.

THERE are numerous timber reserves in Western Australia, the areas containing both jarrah and karri. These areas cover between 30,000 and 40,000 square miles. The jarrah timber predominates. It has been calculated that there are 60,000,000 loads of timber in these forests of a value of £120,000,000 sterling. They are under the supervision of a properly organised Forest Department, at the head of which is a Conservator of Forests, whose duty is to protect the forests from spoilation. In all workable districts there are forest rangers, and great care is exercised in cutting the timber, and no forest lands are allowed to be alienated from the Crown. The timber is shipped from the ports of Albany, Augusta, Bamelin, Busselton, Bunbury, and Fremantle.

The timber lands taken up by the settlers under lease from the Government total 1,052,426 acres, chiefly in the south-western district.

Over 300,000 trees were planted in various localities in 1898, and one or two sandalwood plantations are progressing satisfactorily in spite of many

initial weather trouble. In one district 48,000 wattle-trees have been planted out permanently (within the railway reserve, near Spencer's Brook), and several other wattle plantations are projected for the coming season.

It will thus be seen that the Government of Western Australia is fully alive, not only to the value of forest conservancy, but to forest planting, at least of such useful timbers as sandalwood, and of those of economic value such as the wattle.

LIVE STOCK IN THE UNITED STATES.

THERE are in the United States, according to the latest official returns, 43,948,970 cattle, 38,651,631 pigs, and 39,114,453 sheep. The population of the United States is set down at 63,000,000 of people. The area of the States is 3,500,000 square miles. This would give $12\frac{1}{2}$ head of horned cattle, 11 pigs, and a little over 11 sheep per square mile; or to each 100 persons in the States, 70 cattle, 61 pigs, and 62 sheep.

Let us compare the Queensland statistics with these. We have in this colony 7,000,000 cattle, 23,000,000 sheep, 120,000 pigs. The population of Queensland is about 370,000. The area of Queensland is 668,497 square miles. This would give $10\frac{1}{2}$ head of cattle, one-fifth of a pig, and nearly 35 sheep per square mile; or to each 100 persons in the colony, 1,891 head of cattle, $32\frac{1}{2}$ pigs, and 6,216 sheep.

THE PHILIPPINE SUGAR INDUSTRY.

IN Professor Knapp's report to the United States Department of Agriculture, giving the results of his agricultural explorations in the far East, he gives some interesting data in regard to the sugar industry of the Philippines. His opportunities for investigating in the islands were somewhat restricted by the state of the war, but as his visit was made in December he had some good opportunities to examine into the cane sugar industry. He says the rich clay-loam soil of San Fernando is well adapted to sugar-cane. In the island of Luzon the methods of sugar farming are quite different from those practised in the United States. The cane is allowed to ratoon, but is also planted annually. At the time of cutting the cane for the mill, the immature portion of the stock is planted in a field previously prepared. Very little cultivation is done. The cane matures in 12 months from planting, and is harvested before the rainy season commences in May. The sugar factories in Luzon are the crudest conceivable. The mills are not better than farm sorghum-mills. The kettles are simply wooden tubs with cast-iron bottoms; the sugar is drained upon the open-kettle plan. The proprietor furnishes land and factory; and the tenant furnishes seed, does all the work in the field, delivers the cane to the mill, and supplies most of the hands for making the sugar. The proprietor receives one-half the sugar and all the molasses. The tenant, in theory, is allowed the remainder, but in practice he usually receives about two-fifths of the sugar. Dr. Knapp was informed that in the islands of Panay, Negros, and Cebu the sugar farms and factories are much more improved than in Luzon. Sugar lands produce from 3,000 to 8,000 lb. per acre, depending upon the cultivation and the factory.—*Louisiana Planter*.

POULTRY SHIPMENTS.

THE first shipment of ducklings from Sydney to London this year, sent by the Board of Exports, realised 6s. net profit per pair. Though the salesmen do not hold out hopes of always realising such rates, they state that there is an unlimited demand for ducklings, chickens, and rabbits between January and May in London.

PRESERVE THE FORESTS.

AUSTRALIAN hardwood is fast superseding Swedish timber for paving the London streets. Our hardwood forests, if properly managed, will prove as much a source of wealth in the future as the jarrah and karri forests of Western Australia.

A GOAT STATION.

It is perhaps not generally known that kid gloves are made from goat-skins. The term "kid," as applied to gloves, appears to have no affinity to the term "goat" in the public mind. Be that as it may, millions of pairs of gloves of all shades and thicknesses are the product of the destructive goat.

A gentleman from London, Mr. C. A. Cox, who visited Australia last year, has taken up a selection of 340 square miles, some 40 miles west of Charlotte Waters, South Australia, with a view of stocking it with goats, for the purpose of utilising the skins for glove-making. Mr. Cox's representative has left Adelaide lately for the station to make arrangements for stocking the country.

Here we have another industry which might be advantageously entered upon in Queensland. We look upon goats as a nuisance. So they undoubtedly are in towns and suburbs, but there are many hundreds, indeed thousands, of square miles in this colony which could be utilised for goat-farming, and which would well repay the pioneer goat-farmer. Take the rough broken country of the eastern side of the Main Range or the coastlands, which are useless for farming or cattle and sheep raising. Goats will thrive well on these lands. They do not require large stockyards or fences or stockmen. They are thoroughly domesticated animals, and can be looked after by the small boys and girls of the family, and, in addition to their value as skin-producers, they furnish rich milk and cheese, not to speak of their flesh, which is excellent food if the animal is killed young.

Goat-skins are worth in the Brisbane market from 1s. to 2s. 8d. each; and as goats—that is, the ordinary goats we find about the towns—are only worth from 1s. 6d. to 5s. a head, there should be a large margin of profit to be obtained from them, as they require no expensive food, generally foraging for themselves.

In a work entitled "The Angora Goat," by S. G. Crownright Schreiner, published under the auspices of the South African Angora Goat Breeders' Association, portions of which work are reproduced by *Garden and Field*, we find the following on—

THE ANGORA GOAT AND MOHAIR INDUSTRIES OF AUSTRALIA.

He says: "It was, I believe, from Cape Colony that Australia first obtained her Merino sheep; and it is indirectly due to the same country that she was induced to experiment with the Angora. Her phenomenal success in the one is not more pronounced than her failure in the other." The first seven were imported by Mr. Sechel, of Melbourne, in 1857, from Asia Minor, and found their way to the Melbourne Zoo. Particulars of later importations and attempts at establishing the industry are given by Mr. Schreiner, who specially refers to those of Sir Samuel Wilson in Victoria, who published a pamphlet, "The Angora Goat," in 1873; and Mr. Price Maurice, at Kastamboul, in this colony from 1869 to 1873. The Angora goat industry has not thriven in Australia, and the author concludes that the country is not suited to the animal.

Is HE CORRECT?—Kastamboul is in the Mount Lofty Ranges, about 12 miles from Adelaide, adjacent to Montacute and Highercombe. It is overlooked by the vice-regal residence at Marble Hill. Much of the country is rough and hilly, but is thickly timbered, and the dense scrub is of a very different character to that of Angora. The climate in winter is wet, and, although snow rarely falls, is cold. The rainfall is over 30 inches. The precipitous hills are separated by narrow valleys, with permanent watercourses and small swamps, which, when drained, are among the richest and most productive spots in the world. According to Mr. Schreiner this is altogether an unsuitable locality for the somewhat delicate highly-bred Angora goats. The conclusion forced upon us after studying the book is that the attempts made to introduce the Angora goat into Australia have failed because the localities selected have been unsuitable—too rich or too wet. Had Mr. Price Maurice's efforts been expended on dry arid northern hilly, north-north-west, or north-east shrubby, hilly country, the

results would have been very different. This is, of course, only surmise, but is a fair deduction from Mr. Schreiner's book. His conclusion—"Australia is essentially a sheep country, and so, though the Angora may thrive fairly well in parts, it is so outclassed by the Merino that it does not pay to farm it"—may be essentially correct. He adds, "If the goat is ever farmed there, it will probably be exclusively in parts not suited to the sheep."

ANGORAS AT THE CAPE.—The first Angora goats were imported into Cape Colony in 1834 as a hobby. In 1856 Mosenthal imported thirty, desiring to develop the mohair trade, and next year Sir Titus Salt, being convinced that Turkey could not supply the growing demand, sent out a number. There are to-day 2,982,811 Angora goats in the colony, besides 2,333,956 other goats and kids. In the same year the export of mohair from Cape Colony began with 870 lb., valued at £10. In 10 years it was 50,832 lb., worth £1,963. In 1897 the export was 12,543,601 lb., valued at £676,644. In 1895 America produced about 500,000 lb., thus showing that the industry has never really caught on there. Of the 18,000,000 lb. to 20,000,000 lb. annually produced, England takes nearly all.

The price has fluctuated very much. From 1858 to 1876 it was below 3s. per lb. for brief periods, while it usually ranged between 3s. 3d. and 3s. 9d., and it went as high as 4s. 1d. in 1870. The period of high prices came to an end in 1880 owing to the manufacture of "all-wool cashmere goods." Now the price fluctuates according to the caprice of fashion.

The value of the Cape exports of mohair and ostrich feathers is equal to three-quarters of the wool exported, yet there are 12,500,000 Merinos and Cape sheep in the colony. The ostriches number 267,693.

TREE-GUARDS FOR STREETS OR PRIVATE PLACES—SIMPLE, CHEAP, AND EASY TO MAKE.

By R. R. HARDING,
Curator, Toowoomba Botanic Gardens.

THE trees growing in the streets of this town (Toowoomba) had grown strong enough, so that the old unsightly triangle guards could be taken away. This gave free access for horses, when fastened to the trees, to girdle them; also for vehicles to damage the lower parts. This was done to such an extent that it became a question whether to give them some permanent protection, or to take them out and plant afresh. The trees had been repaired often with pieces of bark taken from others, also with bagging, but to no purpose. Something was needed to be done for them in the way of a guard of such a nature that it could not be utilised by persons to fasten their horses to.

I designed and submitted to the Municipal Council three models of tree-guards. These were adopted, and thinking that the information might be useful to the readers of the *Journal* (as the guards are adapted to orchards and private gardens, streets and parks, where protection is required for the trees), I here give particulars with copies of the designs. They are so cheaply constructed that a boy can make and fix them up, and I am quite sure there are plenty of places where the owner has a few trees growing, but is afraid to let the cattle in to eat the grass for fear of his trees being girdled.

No. 1. — Make.—Procure some battens 2 inches by 1 inch, of the length required. Place these on edge, and bore holes 1 inch from the ends at the top and bottom, and in the centre. Take 1 batten and bore holes the full length 2 inches apart. Cut these off, and this gives a number of blocks, which require to be bevelled off on the inside. These blocks will be of the same width as the battens. Put the requisite number of battens on a level place with a block between each, opposite the holes. Get 3 lengths of pliable wire 1 foot longer than what is required, to allow for the twisting. Pass the wires through the battens and blocks, 2 blocks to be on the end batten, as shown in the diagram. Turn the guard over, take a strip of leather and nail this at the top in a line with the blocks. This is to prevent the guard from injuring the bark. Place

it around the tree, give the wires a twist, and it is complete. As the battens are turned around the tree, the leather, being corrugated, forms a neat protection for it, as shown in No. 4.

The blocks are put flush with the top to prevent anyone fastening horses to the tops of the battens, and if a vehicle strikes the guard it simply turns round, standing, as it does, upon level ground.

The motion of the tree is not in any way impeded; the bark cannot be injured, for the guard moves freely with the tree. For private places these could be made more ornamental.

No. 2. For Crooked Stems, to Make.—This guard is made of wire-netting and pliable wire. Two lengths of 3 feet cut to the width required will give 6 feet in height. This looks neat, and answers the purpose in keeping all animals from girdling the trees, but not so well as the battens in preventing vehicles from injuring the bark. Procure two pieces of wire-netting of the mesh preferred and of the requisite width. Join them together by passing a wire through the meshes at the centre, also at the top and bottom. Stand it around the tree and fasten the wire, closing the netting.

No. 3. To Make.—Procure battens as for No. 1. Place them on the ground (or on three pieces of timber) 3 inches apart at the bottom and $1\frac{1}{2}$ inches at the top. Drive in a small staple slightly at 4 inches from the top and at 6 inches from the bottom, and in the centre. Pass the wire through these staples; allow some for twisting, then drive the staples in until they grip the wires. Turn all over, and nail on a strip of leather as in No. 1. The remarks made for that will do for this. This is the one that is now being used to protect the trees in the streets; it is much easier made than No. 1—in fact, this guard can be made in 15 minutes, and no skill is required.

When these tree-guards were being fixed up the question was asked whether they could be used at the time of first planting. To have a straight stem is one of the most important objects in tree cultivation, and from the system of tying young trees to stakes they occasionally branch out near the ground, and form, instead of a stately tree, a sort of huge shrub. Again, instead of a certain amount of nourishment being distributed sparingly amongst a number of branches or shoots, the same amount may be concentrated amongst a few, if these guards were used instead of stakes, as all the branches would strive to reach the top, and the stem, of course, would be straight, for the sap of the tree would naturally tend to the highest parts. The guards can be used in this way, for instance: Anyone having a piece of ground would like to plant it with trees, and at the same time would like the horse or cow to have the run of the grass. The trees can be planted with safety if the guards are ready, and, after the young trees are in, if three stakes are driven in around it so as to form a triangle, the guard can be folded around these and fastened to the stakes with a piece of wire at the top and bottom.

The guards may be removed at any time by loosening the wires from the stakes, and may then be lifted upwards over the tree, or else by loosening the wires fastening them. The stakes being permanent, there is no disturbance of the roots of the young tree. Any intelligent person can easily adopt such modification as the case may require. The advantage the owner would get is, that all his trees would grow with a straight stem—they would have full play and could not be injured, and the bark of the tree, if these guards were used, would be shaded from the sun's rays.

Any person living in the bush need not go to the expense of procuring hardwood battens. Young saplings or split palings can be used, and would answer the purpose well. Chip off the bark, if saplings are used, where the staples will go, and fasten all together in the same manner as the batten guard, and you have a good substitute, although a rough-looking one. One sees many contrivances used—such as tin, slabs, stakes, and wire-netting—in private grounds, to prevent the trees from being injured; but if guards of hardwood battens were to be used they would last one's lifetime, the cost being less than for one made with stakes and wire-netting.

There are other remedies which can be used to keep animals from girdling trees. Take soap, the dirtier and stronger the better, and make some very strong suds. Dissolve $\frac{1}{2}$ -lb. of whale-oil soap in every 6 gallons of the suds, and stir it in with a brush. Continue stirring until the compound is as thick as good whitewash, and with this mixture wash the trees as high as required. Keep the mixture handy, and repeat the operation as often as necessary. This is a very good application for ensuring the health of the tree, for keeping the bark smooth and fine, and for killing any insects that may come in contact with it. Another good wash is made of air-slacked lime and soft soap brought to the consistence of common paste, with ordinary flour paste added to make it adhere.

WATER AT THE TAPROOT.

THE *Californian Fruitgrower* mentions, as a novel method of getting water to the taproots of orange-trees when the supply of irrigation water is limited, the boring of two holes, at a distance of 3 feet from the trunk, with a 6-inch post auger, and allowing them to fill with water when irrigating, thus placing the water where it is most required—at the taproot of the trees.

[We have long advocated such a process, with the difference that we adopted a plan of sinking inverted beer bottles with the boss knocked out of the bottom, instead of a hole which is liable to silt up.—Ed. *Q.A.J.*]

MANAGEMENT OF AGRICULTURAL SHOWS.

THE success of agricultural shows depends very largely upon the secretary. If he is a good, up-to-date energetic man, and popular withal, his committee will find that their duties will rest very lightly upon them. They will receive valuable assistance and advice from a smart secretary, whilst he carries out their instructions to the letter, and he will generally canvass his district for exhibits, subscriptions, &c. An American show secretary considers that the success of agricultural shows is largely dependent upon the following circumstances:—

- (1.) A board of officers and directors with the one idea of harmonious action in advancing the interests of the fair [*sic*].
- (2.) A secretary alive to the interests of the society, courteous, obliging, and his work always in hand, and ever at his post.
- (3.) A general superintendent, who has all his work ready, grounds and buildings tidy and neat, all caretakers and watchers at their posts, and the work of the society going on like clockwork.
- (4.) Expert judges.
- (5.) A prize-list complete in every detail, and up to present needs.
- (6.) No member of the board or superintendent of classes in any way to communicate with the judges, unless applied to by the judges for information.
- (7.) No favourites, but all treated alike, and in accordance with the rules and regulations.
- (8.) If attractions and entertainments permitted, the utmost care to be exercised.

SUGAR IN THE PHILIPPINES.

FROM the description of sugar manufacture in the province of Pampanga sent to an American journal by a resident in Manila, it would appear that the methods then in use are as antiquated as those adopted in the very earliest days of sugar-growing by the South Queensland farmers.

The cane is crushed in rude mills of wood, stone, or iron. In the province of Pampanga, where this industry is more advanced, the juice is placed in the first boiler, and a little lime is added. The juice is then heated and skimmed; it then goes to the second boilers, and more lime is added from time to time; it is here exposed to a great heat, and a scum arises continually. The man in

charge of the cooking of the juice knows when it has a sufficient amount of lime, because the scum takes on a clear yellow colour, and the precipitates and impurities rise, and the scum changes in colour to a dirty white. When the syrup reaches a temperature of 27 degrees (Baume) it begins to thicken and becomes a clear, coffee colour. It is placed next in a receptacle which is used to receive the results of the day's work. In this receptacle, the impurities settle, and on the next day the juice is dipped out and cooked again until it thickens to a consistency of syrup, and it is then placed in a cooler, which is a wooden trough 2 metres wide by 3 metres in length and some 20 centimetres deep; in this the syrup is kept stirred by means of a long spatula until the mass congeals into a powder formed of small dark crystals. This powder is crude sugar, containing a large quantity of molasses; it is next placed in conical moulds made of gravel, and each of these moulds is placed on gravel beds where the molasses gradually drains off. In order to hasten this process of freeing the sugar from molasses, the natives cover the top of the sugar in the moulds with the bark of the trunk of the banana plant, chopped up to the extent of some 2 or 3 centimetres. The dampness imparted to the sugar by this covering of banana bark precipitates the molasses and rapidly bleaches the mass.

There are to-day many well-regulated sugar refineries owned by Fillipinos and Spaniards, provided not only with good sugar-mills operated with steam power, but also with vacuum pans, centrifugals, and all the latest improvements in sugar manufacturing machinery.

VEGETABLE CUTLETS.

AN appetising dish is vegetable cutlets, simple to make and delicious to eat. They are made of one-half mashed potatoes and one-half equal parts of carrots, parsnips, turnips, and onions. They must all be cooked, and onions cut fine and browned in a little butter. The other vegetables must also be chopped fine after they are boiled, and all mixed with the mashed potato while they are hot. Season lightly with salt and pepper, and for every pint of the mixture add a heaping tablespoonful of chopped parsley. Set away until cold and then form into cutlet, dip in beaten egg and breadcrumbs, brown in hot fat, and serve with a good brown sauce.

KEEPING A MEAL HOT.

In every household there are occasions when it is impossible for every member to be present when the meal is first served.

When it is necessary to keep a meal hot for a belated comer, do not set the plate holding the food in a hot oven, thus discolouring the china as well as drying the food. Instead, place the plate upon the fire over a pan of boiling water, covering the plate with a pan that will just fit over the edge of the plate.

The food will keep hot, and there will be enough steam from the boiling water in the lower pan to keep the plate moist and prevent the contents from becoming dried.

PROTECTION OF RUBBER TREES IN AFRICA.

THE Government of the Congo Free State, with the object of preventing the threatened destruction of the indiarubber-trees in that country, has promulgated a decree by which it is provided that, for every ton of rubber yielded annually, there shall be planted not less than 150 trees. A bureau of control of rubber forests is created, and is charged with the enforcement of the decree of 1892, which prohibits the gathering of rubber in any other mode than through incisions in the bark. Infractions of this new decree, which bears date of 5th January, 1899, are punishable by a fine up to 10,000 francs (£400) or imprisonment.—*Engineer*.

PICKLE FOR CURING HAMS OR BACON.

THE following pickle has been tried in many ways in large factories and small, as well as in the household, and can be relied upon to give perfect results. It is, of course, assumed that the hams or bacon are sweet when put into the pickle: 50 lb. salt, 5 lb. cane sugar, 5 lb. pure saltpetre, and 5 lb. food antiseptic. Make this up to 20 gallons, and boil and skim till clear. The flavour may be made more piquant by adding some juniper berries, about 1 lb., and 1 lb. coriander seeds. These may be put in a canvas bag and allowed to float about in the pickle.

THE AMERICAN WHEAT CROP.

THERE is every reason to suppose that the wheat crop of the United States this season will be one of the smallest grown for some years. American authorities admit that even the low condition of winter wheat returned by the Department of Agriculture for 1st April (77.9 per cent. of a full crop condition) was based on a state of affairs which was not as bad as it became after the reports were collected. Moreover, the report does not take account of the area ploughed up, which is very large. In Kansas, for example, the State Board of Agriculture puts the area ploughed up at 26 per cent. of a crop of 5,500,000 acres, and estimates the remainder at only 68 per cent. of a full crop. Again, a number of reports from Illinois are to the effect that only one-fourth to one-half of an average crop is expected, and one writer says that the area ploughed up will be fully 75 per cent. of the total sown. Even the *Cincinnati Price Current*, which usually takes a sanguine view of crop prospects, says that its correspondence "reflects a condition of affairs with regard to the wheat fields which is unmistakable in seriousness of injury and wide extent of damage. As for spring wheat, it is enough to state that sowing started a month later than usual—a very serious disadvantage, considering the shortness of the season of growth. Hardly any sowing was done before the middle of April."

ANOTHER METHOD OF TANNING SKINS.

WE have on former occasions given directions for tanning kangaroo, bear, opossum, and other skins, but, for the benefit of those who have not had an opportunity of seeing those recipes, we give what is said to be a good one, communicated by a subscriber to the *Australian Farm and Home*. The season for furred skins is now coming on, and doubtless many will be glad to know of a cheap and effective method of preserving them.

Remove the flesh and fat, then wash the skin in solution of sal soda and water. Take 4 oz. pulverised alum, 8 oz. salt, 1 quart new milk to 4 gallons salt water, 1 pint of prepared starch; stir well, and then put in your fur skins, and air them often by hanging them over a stick laid across your tan tub, so they will drain the liquor back into the tub; handle occasionally until they have been in the solution a day or two. Then remove the skins, and add to your liquor a half-teaspoonful of sulphuric acid. Stir this into your liquor well. Put the skins back, and steam them well for about one hour; then take the skins out, and wring and rinse off in soft luke-warm water, and hang them up in a cool place; and when they begin to get white, work and stretch them till they are dry. Hides of large animals should remain in the solution longer.

FELLING TIMBER DURING THE WANING MOON.

THIS has been generally regarded as an old-world superstition without a basis of fact. In a late paper on "Modern Gold-mining in the Darien," Republic of Columbia, S.A., presented to the American Institute of Mining Engineers, Mr. Ernest R. Woakes, of Panama, has some notes on this head. He says that the country is completely covered with forests; but not 50 per cent. of the trees are fit for lumber, and about 25 per cent. are not even good for firewood. "Unless all timber is felled in the waning moon," says Mr. Woakes, "it will commence to rot

almost as soon as cut, due, probably, to the rapid fermentation and decomposition of the sap, which is supposed to be present in the wood in greatest quantity during the waxing moon." Mr. Woakes says that he expects engineers to laugh at the idea; but he warns the scoffers that experience is abundant in support of the theory; and lumbermen from the Western States, who came there to get out timber for the stamp-mills, and refused to obey the native warning, found that nearly all their sawn timber rotted before the carpenters could use it.—*Engineering News.*

USEFUL INFORMATION FOR FARMERS.

AN EASY MODE OF HARDENING PLOUGHSHARE POINTS.

A VICTORIAN farmer, who regularly gets the *Queensland Agricultural Journal*, sends us the following:—"Frequently the patience of a farmer is seriously tried by working with a share which is so very much worn on the under side that it is difficult to keep it in the ground. To remedy this, when a blacksmith is not conveniently available, the farmer should get a portable forge and anvil, and dress the share himself. When dressed, put it back into the fire, and at the same time put a piece of hard cast iron in with it. When both have come to a white heat, take them out and rub the cast iron well on the under side of the share-point, after which plunge the share into cold water. This process will leave a coating of very hard chilled iron on the share-point, which will last a long time."

Our correspondent says the above mode of dressing ploughshares, under the circumstances stated, is not generally known in the part of Victoria in which he resides, but he has used the process himself, and can vouch for it being a good one.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR MAY.

| Article. | | | | | | | | | | MAY. | | |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------------|----|-----|
| | | | | | | | | | | Top Prices. | | |
| | | | | | | | | | | £ | s. | d. |
| Bacon | ... | ... | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 6½ |
| Bran | ... | ... | ... | ... | ... | ... | ... | ... | ton | 5 | 10 | 0 |
| Butter, First | ... | ... | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 10½ |
| Butter, Second | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 0 | 7½ |
| Chaff, Mixed | ... | ... | ... | ... | ... | ... | ... | ... | ton | 4 | 2 | 6 |
| Chaff, Oaten | ... | ... | ... | ... | ... | ... | ... | ... | " | 4 | 10 | 0 |
| Chaff, Lucerne | ... | ... | ... | ... | ... | ... | ... | ... | " | 1 | 13 | 1½ |
| Chaff, Wheaten | ... | ... | ... | ... | ... | ... | ... | ... | " | 3 | 0 | 0 |
| Cheese | ... | ... | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7½ |
| Flour | ... | ... | ... | ... | ... | ... | ... | ... | ton | 7 | 16 | 3 |
| Hay, Oaten | ... | ... | ... | ... | ... | ... | ... | ... | " | 3 | 2 | 6 |
| Hay, Lucerne | ... | ... | ... | ... | ... | ... | ... | ... | " | 3 | 16 | 3 |
| Honey | ... | ... | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 2 |
| Japanese Rice, Bond | ... | ... | ... | ... | ... | ... | ... | ... | ton | 13 | 5 | 0 |
| Maize | ... | ... | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 8 |
| Oats | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 3 |
| Pollard | ... | ... | ... | ... | ... | ... | ... | ... | ton | 5 | 11 | 3 |
| Potatoes | ... | ... | ... | ... | ... | ... | ... | ... | " | 4 | 6 | 3 |
| Potatoes, Sweet | ... | ... | ... | ... | ... | ... | ... | ... | " | 2 | 1 | 3 |
| Pumpkins, Table | ... | ... | ... | ... | ... | ... | ... | ... | " | 1 | 12 | 6 |
| Sugar, White | ... | ... | ... | ... | ... | ... | ... | ... | " | 14 | 10 | 0 |
| Sugar, Yellow | ... | ... | ... | ... | ... | ... | ... | ... | " | 12 | 5 | 0 |
| Sugar, Ration | ... | ... | ... | ... | ... | ... | ... | ... | " | 10 | 0 | 0 |
| Wheat | ... | ... | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 5½ |
| Onions | ... | ... | ... | ... | ... | ... | ... | ... | cwt. | 0 | 4 | 10½ |
| Hams | ... | ... | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 9½ |
| Eggs | ... | ... | ... | ... | ... | ... | ... | ... | doz. | 0 | 1 | 6½ |
| Fowls | ... | ... | ... | ... | ... | ... | ... | ... | pair | 0 | 3 | 10½ |
| Geese | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 5 | 0¾ |
| Ducks, English | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 6½ |
| Ducks, Muscovy | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 4 | 9 |
| Turkeys, Hens | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 6 | 7½ |
| Turkeys, Gobblers | ... | ... | ... | ... | ... | ... | ... | ... | " | 0 | 14 | 3 |

ENOGGERA SALES.

| Article. | | | | | | | | | | MAY. | | |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|-----|
| | | | | | | | | | | Top Prices. | | |
| | | | | | | | | | | £ | s. | d. |
| Bullocks | ... | ... | ... | ... | ... | ... | ... | ... | ... | 5 | 0 | 0 |
| Cows | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | 9 | 5¾ |
| Wethers, Merino | ... | ... | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 7½ |
| Ewes, Merino | ... | ... | ... | ... | ... | ... | ... | ... | ... | 0 | 8 | 4½ |
| Wethers, C.B. | ... | ... | ... | ... | ... | ... | ... | ... | ... | 0 | 12 | 10½ |
| Ewes, C.B. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Lambs | ... | ... | ... | ... | ... | ... | ... | ... | ... | 0 | 9 | 2½ |
| Baconers | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | 3 | 0 |
| Porkers | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | 7 | 4½ |
| Slips | ... | ... | ... | ... | ... | ... | ... | ... | ... | 0 | 13 | 2 |

Orchard Notes for July.

By ALBERT H. BENSON.

THE pruning of all kinds of deciduous fruit trees should be completed during this month. All prunings should be gathered and burnt, and the trees should then receive a good winter spraying with the sulphur, lime, and salt wash. After pruning and spraying, the orchard should be ploughed, so as to bury all trash and weeds that have accumulated, as well as to sweeten the soil and break up any pan that may have been formed by summer cultivations.

Citrus trees, from which the fruit has been gathered, should also be gone over carefully; all dead branches, or branches with borers in them, should be cut out and burnt. The inside of the tree should be thoroughly well thinned out, care being taken not to open up the head too much. As a general rule the pruning of citrus trees is greatly neglected in this colony, the trees being allowed to grow into a dense mass, which forms the best possible harbour for all kinds of scale insects and a breeding ground for various fungus diseases. Such trees cannot be kept clean by spraying, as it is impossible to get the spraying material used on to all parts of the tree. On the other hand, when the inside of the tree is well thinned out, there is little harbour for pests, and those that are present can be reached by spraying. In the Orchard Notes for June, I recommended a dressing of sulphur, lime, and clay or fine flour, to be applied as a paint to the trunks and main branches of citrus and other fruit trees after they have been pruned; and I can only repeat what I then said, viz.:—That where San José, Greedy, Mussel, or Parlatoria scales of deciduous trees, and Red, White, Circular, Black, Mussel, or other scale insects, and fungus growth of all kinds of citrus trees are present, this method of treatment is even more efficacious than the sulphur, lime, and salt spray for deciduous trees, or the resin, soda, and fish-oil wash for citrus trees. Painting the trunks and main branches does not, however, do away with the necessity for spraying, as the smaller branches, twigs, and leaves can only be reached by means of the spray-pump. The best results are obtained by painting the large wood and spraying the rest of the tree. Planting can be continued throughout the month. Don't plant too deep; the depth at which the tree stood in the nursery row is the right depth to plant. Cut back hard when planting; don't be afraid that you will spoil your tree, as if you don't cut back hard you will never get a symmetrical well-grown tree, and your failure to cut back will always tend to injure the future growth and vigour of the tree.

Don't plant rubbish, and only plant those trees that your soil and climate are adapted for. Remember that the climatic conditions of this colony, with the exception of the Stanthorpe district, are altogether different to that of the colder parts of the southern colonies, and that therefore we cannot grow the same fruits here, in our tropical and semi-tropical districts, that are grown successfully in the south. I wish to call attention of all fruitgrowers to this very important matter. I especially wish to warn fruitgrowers and intending fruitgrowers not to plant varieties that are unsuited to the climate, and advise all such to consult the Department of Agriculture as to the suitability or otherwise of the fruits they wish to plant, as I am certain that they will find it to their advantage to do so.

It costs just as much to prepare the land for and to plant, prune, and look after an inferior variety or a variety of fruit that is unsuitable to the climate, and from which no return of any value will ever be obtained, as it does to grow a variety that is suitable to the climate and that will produce superior fruit that will meet with a ready sale; therefore, no fruitgrower can afford to spend time and money growing unsuitable varieties, and the sooner that this is realised the better for the fruitgrowing industry of this colony.

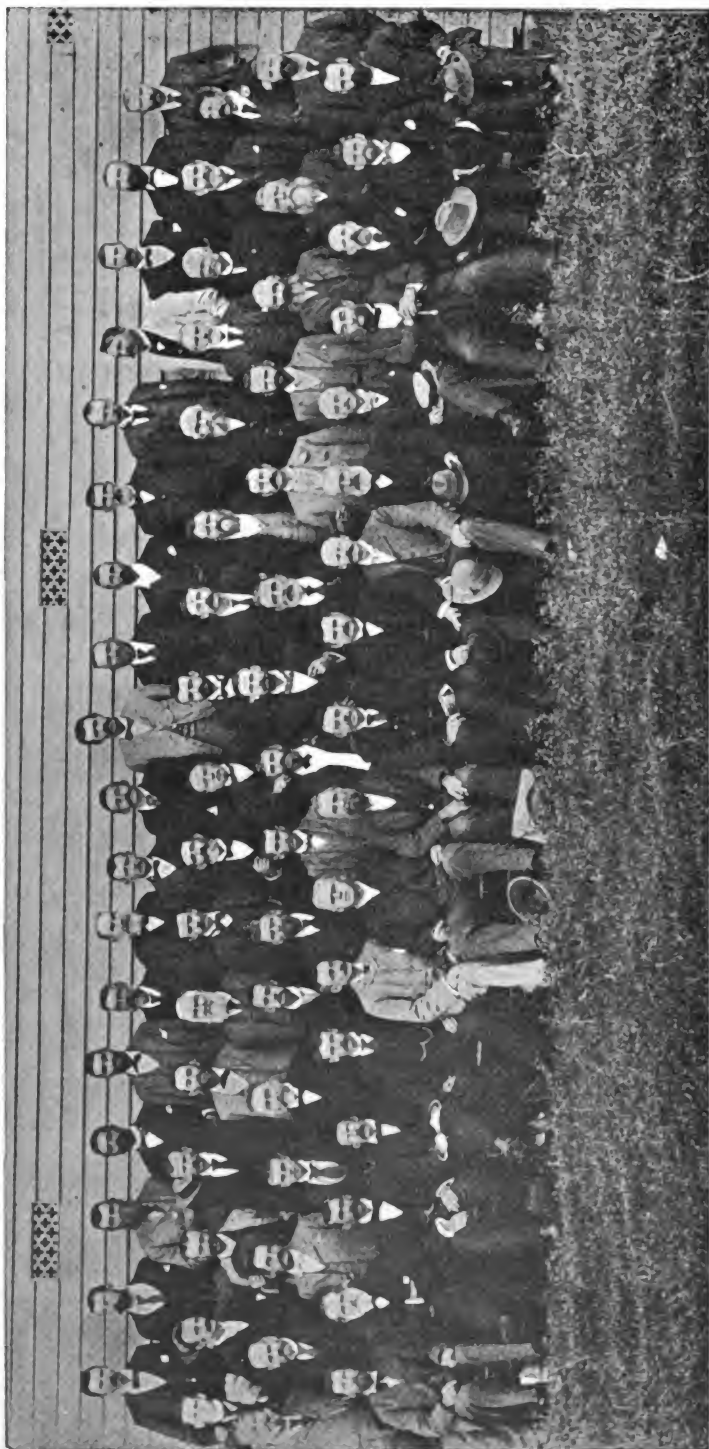
Farm and Garden Notes for July.

Farm.—Land should now be prepared for potatoes, maize, oats, barley, vetches, tobacco, sugar-cane, field carrots, mangel wurtzel, swedes, &c. There is no better time for sowing lucerne. The most suitable soil is a deep, calcareous loam, where the roots can penetrate deep down into the subsoil in search of moisture. Should the subsoil be at all tough, it should be loosened to a depth of at least 18 inches, by the help of the subsoil plough, but the subsoil must on no account be brought to the surface. The land must then be brought to as fine a tilth as possible to give the seed every chance of germinating. After sowing, a light harrow run once over the land is sufficient to cover the seed. Some prefer sowing in drills, but this can scarcely be recommended, as the weeds will grow between them and choke the tender lucerne plants before they have time to cover the ground. As to the quantity of seed to sow, there are great differences of opinion, but the general experience is that from 10 lb. to 12 lb. of seed is the correct quantity to sow per acre. Early potatoes, sugar-cane, and maize may be planted in the earlier districts, but where late frosts occur it is well to wait until all risk of the young plants being nipped is over. During suitable weather rice may be planted in the North, where also the coffee crop should be harvested. Cinnamon and kola-nut cuttings may be planted under glass. Yams and turmeric may be unearthed, and New Guinea tobacco gathered.

Kitchen Garden.—Put in successional sowings of carrot, parsnip, broad beans, lettuce, and other salads, peas, turnips, beet, leeks, onions, &c. Asparagus and rhubarb may be planted, also cabbage and cauliflower. Plenty of watering and hoeing will probably be required while the drying westerly winds are blowing. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Ground should now be prepared for planting potatoes, and in localities where there are no frosts a commencement of planting may be made towards the end of the month. In the same warm districts it will be quite safe to sow cucumbers, marrows, and squashes during the last week of the month. Ground should now be got ready for sowing French beans and other spring crops. Any land which is vacant should be ploughed up or dug and left rough until it is required. Harrowing and pulverising ground too long before it is sown or planted only encourages the growth of weeds, and also deprives the soil to a great extent of the sweetening influences of the sun and rain and air.

Plate OXXIII.

DELEGATES AT AGRICULTURAL AND PASTORAL CONFERENCE, MACKAY, 26th-29th JUNE, 1899.



BACK ROW (*from the left*).—W. J. Affleck, G. Turner, J. Crook, P. W. Cameron, J. Parke, A. Hunter, T. Mackay, T. Ridley, G. W. Pott, J. Johnston, W. D. Lamb, H. M. Stevens, R. Gibson, E. S. Aiken, B. O. Brookes, L. P. Landsberg, Wm. Beale, W. Thompson.

SECOND ROW.—Walker, D. Thomatis, N. J. Mikkelsen, W. McCullagh, C. Athow, J. Hudson, J. Logan, junr., M. O'Keefe, H. E. Wymann, T. F. Stubbins, H. Cattermull, E. Hicks, G. Palk, J. Williamson, T. S. Beatty, W. Dunn, G. Muntz.

THIRD ROW.—C. Wyatt, E. Grimley, G. A. Waite, P. Noakes, J. C. Kennedy, A. Ulcoq, K. W. Scholz, S. E. Tooth, C. F. M. Fischer, J. M. Bryce, D. Watson, J. E. Leask, C. J. Booker, A. C. Walker, W. Clayton, J. Mactaggart.

FRONT ROW.—F. G. Jones, W. Gibson, J. P. Orr, A. A. Ramsay, K. Wilson, R. W. McCulloch, R. S. Nevill, P. McLean, Hon. J. V. Chataway, J. Mahon, J. C. Brinnich, A. Watt, J. O'N. Brennan, J. E. Noakes, W. Deacon, F. W. Peek, A. M. Broom.

Agricultural and Pastoral Conference.

AT MACKAY, 26TH, 27TH, AND 28TH JUNE, 1899.

AN Agricultural Conference, organised by the Department of Agriculture, similar to the previous conferences, held at Gatton in 1897, and at Rockhampton in 1898, was held at the Britannia Hall, Mackay, on the 26th, 27th, and 28th June, and was attended by representatives from the majority of the leading agricultural associations of the colony. There were present:—

Chairman: Hon. J. V. Chataway, M.L.A., Secretary for Agriculture.

Queensland Stockbreeders' and Graziers' Association—J. Mactaggart (Brisbane) and T. S. Beatty (Collaroy). Queensland Acclimatisation Society, Brisbane—E. Grimley and C. Atthow. Horticultural Society of Queensland, Brisbane—E. Grimley (Brisbane) and G. Williams (Runcorn). Zillmere Horticultural Society, Zillmere—C. F. M. Fischer and T. Ridley. Burpengary Farmers' Association—J. M. Bryce (Brisbane) and W. McCullagh (Narangaba). Agricultural and Pastoral Society of Southern Queensland, Beenleigh—G. Palk and J. Williamson. Logan Farming and Industrial Association, Beenleigh—F. W. Peek (Loganholme) and W. Dunn (Beenleigh). Southern Queensland and Border Agricultural and Pastoral Association, Nerang—E. Hicks (Southport). Queensland Pastoral and Agricultural Society, Ipswich—R. J. Blake (Blenheim). Ipswich and West Moreton Agricultural and Horticultural Society, Ipswich—H. E. Wyman and P. W. Cameron. Rosewood Farmers' Club—H. M. Stevens and J. Hudson. Lockyer Agricultural and Industrial Society, Laidley—A. Hunter and J. Logan, junr. Fassifern and Dugandan Agricultural and Pastoral Society, Boonah—T. F. Stubbin. Eastern Downs Horticultural and Agricultural Association, Warwick—W. D. Lamb (Yangan). Central Downs Agricultural and Horticultural Association, Allora—W. Deacon and J. C. Kennedy. Viticultural and Horticultural Society, Stanthorpe—K. W. Scholz. Gympie Horticultural Society—H. Y. Daunt and C. Snooks. Wide Bay and Burnett Pastoral and Agricultural Society, Maryborough—C. J. Booker (Woolooga). Pinalba Farmers' Association—S. E. Tooth (Pinalba). Tinana Fruitgrowers' and Farmers' Association—J. Parke (Tinana). Biggenden Agricultural and Pastoral Society—F. G. Jones (Biggenden) and J. E. Noakes (Maryborough). North Isis Canegrowers' Association—A. C. Walker (Knockroe) and W. Clayton. South Kolan Agricultural and Progress Association—W. Gibson (Bingera). Avondale Farmers' and Planters' Association—A. M. Broom (Miara) and N. J. Mikkelsen. Woongarra Canegrowers' and Farmers' Association—D. Watson and H. Cattermull. Gooburrum Farmers' and Canegrowers' Association—J. E. Leask and R. S. Aiken. Isis Agricultural Association, Childers—William Thompson and William Beale. Rockhampton Agricultural Society—W. Toft and E. N. Rogers. Central Queensland Farmers' and Selectors' Association, Rockhampton—L. P. Landsberg and J. Crook. Pioneer River Farmers' Association, Mackay—E. Denman and E. Swayne. Bowen Pastoral, Agricultural, and Mining Association—G. Turner and G. A. Waite. Proserpine Farmers' and Settlers' Association, Bowen—Gideon W. Pott. Townsville Pastoral, Agricultural, and Industrial Association—C. Wyatt and W. J. Affleck. Lower Burdekin Farmers' Association, Ayr—G. Campbell and R. Gibson. Herbert River Farmers' League—A. Henry. Herbert River Pastoral and Agricultural Association—A. Henry. Cairns District United Farmers' Association—Dr. Thomatis and T. Mackay. Johnstone River Farmers' Association—B. O. Brookes. Mosman River Canegrowers' Association, Port Douglas—G. Muntz.

Officers of the Department of Agriculture: Peter McLean (Under Secretary), John Mahon (Principal, Agricultural College), J. C. Brünnich (Agricultural Chemist), R. W. McCulloch (Valuator, Sugar Works Guarantee Act), J. O'N. Brenan (Principal Polynesian Inspector), A. Watt (Farm Foreman, Agricultural College), J. P. Orr (Stock Department), R. S. Nevill (Instructor in Tobacco Cultivation), Dr. S. Hunt (Government Pathologist), A. A. Ramsay (Sugar Experiment Station).

Messrs. Ulcoq (Brisbane), M. O'Keefe (Blenheim), and a number of Mackay gentlemen also attended the sittings of the Conference.

In opening the proceedings, the Hon. J. V. CHATAWAY said: His Worship the Mayor of Mackay—Mr. S. Lambert—is anxious to address to you, gentlemen, a few words of welcome, which he will now do.

THE MAYOR, in response, said: Gentlemen,—As Mayor of this town, I beg to extend to you a most hearty welcome, and I am very pleased indeed to see our esteemed representative—the Hon. J. V. Chataway—occupying the position of Chairman of this Conference. I feel sure that it is principally due to his influence that this Conference is held here at the present moment; and I also feel pleased that it is held here, because I am given to understand that it was from Mackay that these conferences were first mooted. We are also indebted to the Department, over which our esteemed representative presides, for the large number of delegates who are now present. And I feel sure that this Department has discovered that it is by the medium of these gatherings, by the interchange of ideas and of practical knowledge, that the interest of the agricultural industry can be furthered, and be more satisfactorily developed, and that more good can result by meeting in this way periodically than by any other means. I trust that your deliberations will be profitable; that your visit to Mackay may be pleasant and enjoyable; and that in years to come you may be able to look back to this Conference of 1899 with pleasure. I have to inform you that, for your entertainment this evening, there will be a performance of "Aladdin" in the School of Arts, given by the School of Arts Entertainment Club, and that you are all cordially invited to be present, seats having been reserved for the whole number of visitors. I am also to intimate, on behalf of the School of Arts Committee, that the reading-rooms and library are at your disposal during your stay here. The School of Arts Entertainment Club have placed their chess and card rooms at your convenience. On Wednesday and Thursday the Pioneer River Farmers' Association hold their annual show, and you are also cordially invited to attend it. Mr. Norris, our schoolmaster, has wished me to intimate also that anyone who would like to visit Mount Oscar is at liberty to do so. I may say Mount Oscar is about 2 miles distant, and from it you can get the best view in the district—in fact, on a fine day, one of the prettiest views in Queensland. Mr. Norris extends a hearty welcome to anyone who desires to go there. There are, I believe, further means of delegates spending any leisure time at their disposal. I understand the farmers at Homebush are making arrangements to entertain them there. However, if your time should not be fully occupied, perhaps our esteemed member, Mr. Chataway, will give us an address on federation or on something else of interest. I think this would be a good opportunity for him to do so. We are all here pretty well in the dark as to this matter, and I feel sure that we should be guided a good deal by such an address, because Mr. Chataway has had more opportunity of discussing and hearing discussed this Federation Bill than we have. I shall not detain you much longer, gentlemen. I feel sure that everything you ask for you will get. You have here Mr. Chataway, the Minister for the Department, and I know he will do what he can to help you. You have got Mr. McLean and Mr. Mahon, and I think everyone you want. I can only conclude by expressing the hope that your stay here will be pleasant and enjoyable, and anything I can do to make it so will be done. (Applause.)

MR. CHATAWAY: I think on behalf of the delegates I must thank the Mayor for his kindly welcome. The President of another body in this district—the Pioneer River Farmers' Association—also desires to say a few words.

Mr. P. McKENNEY (President, P.R.F.A.): As our worthy chairman has intimated, I have also got a few words to say on this occasion, but, as the time is so short, I shall only add with all my heart that I can but endorse the words that have been so sincerely put forth by Mr. Lambert. I cannot attempt to add to those words, but I would just like to duplicate them on behalf of the Pioneer River Farmers' Association. To attempt to do more would be to "gild the gold or paint the lily." I shall therefore conclude by stating that you have all been elected honorary members of the Pioneer River Farmers' Association.

The Hon. J. V. CHATAWAY then opened the Conference with the following address:—

CHAIRMAN'S ADDRESS.

In opening this, the Third Annual Agricultural Conference, a few words may not be out of place as to the objects and scope of these conferences. They were initiated with the intention of bringing the farmers together, and enabling them to discuss questions of common interest, and formulate, by full consideration and debate, such measures of public policy as might appear on mature thought to be required. To accomplish these ends, it was necessary that the *locale* of the conferences should be changed each year, and consequently our first gathering was at Gatton, in the Southern district, our second at Rockhampton, in the Central district, and our third has now commenced in Mackay, the most accessible town in the Northern portion of the colony. It was naturally a matter of some anxiety to the Department to decide whether, in our opinion, the farmers of Queensland took sufficient interest in the agricultural and pastoral questions to induce them to travel so long a distance as to Mackay. We concluded that there was a live interest in the conferences, and that delegates would come to the North. The splendid attendance to-day—a record attendance of delegates, I believe—is ample proof that we were not mistaken, and full justification for our having called the Conference for this town in the North. If I may take up some of your time, I would like to briefly review the latest position of the agricultural industries of this colony.

LAND SETTLEMENT.

The progress of land settlement has perhaps been the most satisfactory feature of all. In the year 1896, 3,018,769 acres; 1897, 4,893,624 acres; and 1898, 16,079,253 acres were proclaimed open for selection. From the above figures it will be seen that more than double the amount was available for selection in 1898 than the two previous years. At one time there were many complaints that applicants were unable to obtain land; but now, although there is no diminution in the amount taken up, any applicant can be satisfied. The following will show the amounts of land taken up:—In 1896, 2,358,380 acres; 1897, 3,629,651 acres; 1898, 3,339,613 acres. The following figures are a striking comparison of the increased settlement taken place in the colony:—During the years 1893, 1894, and 1895, 3,664,818 acres were taken up, and during the next three years (1896, 1897, 1898) 9,327,644 acres, or an increase of 5,662,826 acres.

Considerable favour is shown to settlement in this colony by the people of Victoria and South Australia, from which two colonies very many trained and seasoned settlers annually come.

In agricultural settlement the progress is especially satisfactory. Last year I alluded to the increase of exports of agricultural products and the decrease of imports. And it is very gratifying to note that this still continues. There is still, however, much to be done in this direction. The agricultural produce coming into this colony is of the value of about £750,000, and the duty paid on it over £100,000. All this and much more might be produced in Queensland, and ought to be. Dried fruits alone contributed £33,000 to the revenue. Our exports of agricultural produce show much more satisfactory returns, and now we are exporting four times as much as we did five years ago.

WHEAT.

The wheat crop last year was, owing to dry weather and comparative failure, most unsatisfactory. No less than 23,914 acres failed to germinate. Undeterred by this disaster, our farmers have been putting in more wheat than ever this year, and there is every appearance of an excellent harvest. Within a few years we shall hear of the Central districts as large wheat-producers. Such small areas as have been planted near Emerald and Barcaldine are reported as looking most promising. Queensland offers special inducement to the wheat-grower, climatic and soil conditions being eminently suited. This is strikingly observed from the average production per acre in Queensland as compared with the principal wheat-producing colonies in Australasia:—Queensland, average per acre 16·32 bushels; Victoria, average per acre 8·06 bushels; South Australia, average per acre 5·09 bushels.

SUGAR.

The progress made by sugar last season was very great, the output increasing from 97,916 tons in 1897 to 163,734 in 1898. The average yield is still low, standing lower than almost any other sugar-producing colony. Java and the Sandwich Islands produce more than three times as much sugar per acre. This is due entirely to their system of cultivation and manuring. It was not so long ago since the manure from the Queensland Meat Works was going to Mauritius, so enabling that island to compete successfully with us in the Melbourne and Adelaide markets.

The net importations of sugar into Australasia were for 1898:—New South Wales, 34,678 tons; Victoria, 56,597 tons; South Australia, 28,105 tons; Western Australia, 7,218 tons; Tasmania, 6,752 tons; total, 127,310 tons. If we add 24,300 tons, the estimated consumption of Queensland, we have a total of 159,610 tons required by the colonies proposing to enter into Federal Union. To supply this amount we made last year 163,734 tons, so that it will be seen that we are already producing 12,124 tons in excess of the Australian requirements. The sugar-growers have realised the position, and are already seeking a market outside Australia. Last year over 9,000 tons were sent to Vancouver, and a larger amount will go there this year. Three thousand tons were sent to Hong Kong, and small consignments to Japan. The narrow margin of profit now earned, by those engaged in the sugar industry, leads us to look for some means to enable growers of cane to enlarge their area, at the same time lessening the risk of ruin through having one crop only. This will probably be found in dairying in combination with sugar-growing. We have examples of the successful combination of these two industries in one district of the colony, where the canegrower is able and willing to send to the mill at a price which would be considered ruinous were he not improving the land with the manure got from the cattle and using as feed the cane-tops which were hitherto burnt and so wasted.

DAIRYING.

The progress of dairying by the factory system is gradually making headway. Gympie and Bundaberg have each established a factory. At the present time two factories are being established in the Central district—one at Emerald and another at Capella—and I trust there will be some in the Northern district before long. In this district it is to be hoped there will also be one before long. With dairying, pig-raising is associated, and very profitably. The last two years has shown a considerable increase in the number of pigs raised in the colony, and it is quite evident that, with attention paid to breeding and feeding, the profits of pig-raising are great. The number of bacon factories now established in the colony forms a safe and profitable outlet for pigs, which farmers are not slow to avail themselves of. Last year 85,510 pigs were sold for preserving purposes in the shape of bacon and hams, apart from those killed for local use, and these produced 6,973,000 lb. of bacon and ham.

With reference to condensed milk, some difficulty was at first experienced in this business; but the enterprising owners of a factory which has long been struggling, having sent their manager to America and expended a large sum in having him taught the trade, are now assured of success, and it will not be long before the 1,500,000 lb. of condensed milk, of the value of £30,000, now imported, is manufactured locally.

TOBACCO.

The tobacco industry of the colony may be said to be progressing, each year seeing an increased consumption of the home-grown leaf. The bulk of this tobacco is grown in the Texas district and is bringing satisfactory prices—from 6d. to 8d. per lb. This district grows a good quality of heavy tobacco, and will eventually displace the American of this type, when the growers have fully learned the approved methods of growing and curing; and in this they are making progress. North Queensland gives promise of growing a very superior quality of cigar tobacco, and it will probably become an important industry, as some of the leading farmers are proposing to take up tobacco-growing. Herebefore this industry has suffered for the want of a market, but with the assurance that this trouble can be overcome, they are disposed to again take it up. Samples of tobacco grown in the Cairns district have been valued in London at 2s. 6d. per lb.

PASTORAL INDUSTRY.

There is a considerably brighter outlook for the pastoral industry now than appeared twelve months ago. It is true our flocks and herds do not show an increase, but the decrease is so slight as to cause no alarm, and indeed is largely accounted for by the increasing output from our works.

Wool.—The recent change of fashion in favour of merino, as against crossbred wool, has to meet a very precarious supply. Our largest competitor, Argentina, has gone in for crossbreeding, and the supply of merino from there is very small. The Cape clip is so comparatively small that it exercises very little influence on the market. The losses in sheep in New South Wales from drought have been enormous. From 61,000,000 a few years ago, the sheep dwindled down to 40,000,000 at the end of last year, while during the present year the loss from drought is estimated to further reduce the number to between 25,000,000 and 30,000,000. Our losses up to date have not exceeded 1½ per cent., so that we may confidently expect a further rise in the price of our staple product.

Meat Trade.—The export meat trade has now settled down to c.i.f. orders from England, instead of companies freezing on owners' account, and is not now of a speculative and hazardous nature as formerly. This mode of conducting the business has two very great advantages—first, in owners selling for cash here, and second, in not running the risk of an overstocked market in England. The opening up of regular foreign markets will steady prices, and the almost complete depletion of the New South Wales fattening paddocks must create a very keen demand for our store cattle on the breaking up of the drought.

At last year's Conference I pointed out that, on the whole, it would be far more profitable to Queensland if our cattle-owners were able to dispose of their produce locally instead of sending them over to the other colonies by methods which are both expensive and wasteful. The erection of new works and the increased capacity of those already existing have now put us in the position of being able to deal with the greater part of the annual cast from our herds. A few stations are so situated that Adelaide will always be their natural market. Chilled meat trade is being successfully established with New South Wales, and, in spite of the heavy tariff, some shipments to Melbourne have not been entirely unremunerative. The stock tax and the tariff on meat, which now press so hardly on the Victorian consumer, are almost doomed, and, if I may judge from the debates during the last session of Parliament in Melbourne, they cannot be maintained much longer.

Extract.—A warning note should be given to those engaged in the meat export trade to export none but extract of the very best quality. Australia came very rapidly to the front in the extract trade, but has as rapidly declined in favour, so much so that some of the principal manufacturers of it desire to place their stocks on the English market without any marks which shall identify them with Australia.

It now only rests for me to formally declare this Conference opened. In doing so I have great pleasure in welcoming you all to Mackay. Particularly am I glad to do so, as I know that in welcoming you I express the feeling not only of myself but also of my constituents. Both on my own account and also on that of my many friends here, I may express the hope that, while judiciously combining pleasure with business, you will be able to leave with a useful record of the latter, and with kindly recollections of the town and district, and with the people amongst whom you have held your third Conference. (Applause.)

The CHAIRMAN stated that the appointment of committees was the next business to be dealt with, and it was agreed that the most necessary action for immediate purposes was to form a committee to deal with the various resolutions passed.

RESOLUTIONS.

On the motion of Mr. McLEAN, the following resolutions were then carried:—

That delegates shall not speak more than once on each subject, and not longer than five minutes; the reader of a paper to be allowed ten minutes to reply.

That the following constitute a Committee of Resolutions:—Messrs. E. Denman, F. W. Peek, W. Deacon, J. E. Noakes, and C. J. Booker; Mr. F. W. Peek to be convener.

Mr. DEACON (Allora): Before we proceed to business I should like to thank the Mayor, the President of the Pioneer River Farmers' Association, and yourself, Mr. Chairman, for the most hearty welcome we delegates have received in Mackay. I do not think it is necessary to move a special motion, but still I think it incumbent that one of us should express these words of thanks.

Mr. E. DENMAN (Etowri, Mackay) then read the following paper on

THE SUGAR INDUSTRY AND ITS REQUIREMENTS.

Mr. PRESIDENT and GENTLEMEN.—For the third time the P.R.F.A. has chosen me as one of its delegates to our annual Conference. I have taken the "Sugar Industry and its Requirements" as the title of the paper I am about to read. I purpose to review some of the many suggestions offered both by kindly friends and censorious critics as means which would afford canegrowers a large measure of relief. I also intend to offer suggestions myself which a long experience and anxious thought convince me will, if carried into effect, not only render the sugar industry more stable and more profitable to those whose all is invested in it, and to those who are at the present time dependent upon it—some 22,000 souls—but will also lead to a much greater expansion than can ever be hoped for so long as it is impeded by unwise, if not hostile, legislation. I am further satisfied that they would hasten, slowly and surely, the desiderata devoutly wished by so many, and by none more fervently than the canegrowers themselves—namely, the substituting of white for alien labour, at a fair rate of wages. On the present occasion I do not intend to confine myself entirely to the farmers' needs. I intend to also enter a plea on behalf of that very necessary adjunct of the farmer, the sharer of his woes and sorrows, which is about all most of us have to share with her—the farmer's wife. To accomplish this great change, ample time must be given and wise counsels must prevail. Sacrifices both of sentiment and substance will have to be made, and it behoves those into whose hands the power of determining the future of others is entrusted to make these sacrifices as light as possible. Sentiment is all very well if it is not at variance with fact, and legislation, equally as much as farming or any other business, to be successful, must be based on business principles, not on sentiment. During my connection with the sugar industry I have had personal experience in two instances of the disastrous results which followed attempts to incorporate sentiment with canegrowing. Sentimental legislation was some years ago forced upon the canegrower. Everyone in this room,

everyone in Queensland, knows that it failed. It proved the very thing that it was intended to disprove; it resulted in ruin to some, and loss to all; and those who wrought it had themselves to rescind their own measure. Surely, after this, cane-growers were reasonably entitled to expect that they would be allowed the quiet enjoyment and rational use of the labour their opponents had proved to be necessary! Many people are under the impression that cane-growing was started with white labour, and that the early planters (now no more) substituted kanaka labour on the sole grounds that it was cheaper. This is not only unjust to the planters, but utterly wrong in fact. When Queensland broke the bonds which bound her to New South Wales—bonds which I sincerely hope (apart from all personal self-interest) will never be reformed—it was early seen that her future prosperity depended in a great measure upon her ability to utilise her vast area of tropical lands for the purpose of cane and coffee cultivation. The first Parliament of Queensland placed upon our statutes an Act under which free grants of land were offered to induce people to embark in these industries. It also placed at the same time other Acts thereon, under which the necessary field labour required by these industries could be obtained not only from the South Sea Islands but from the East Indies also. And the very fact that during the twenty-five years the East Indies Coolie Act was on our statutes not a single employer took advantage of it, proves most conclusively that the employers of alien labour, from its inception, were actuated by a desire only to introduce the class of labour bound to create work for white labourers, and least likely to come into competition with them, and refrained from introducing a class which most certainly would have done so, notwithstanding the fact that their introduction would have cost much less, and that they would otherwise have been much cheaper to the planters.

If the intelligent, enterprising, and undesirable Jap has of late years been introduced into our canefields, it was forced upon employers owing to the uncertainty of and the harassing restrictions placed upon employers of kanaka labour.

So imperative is reliable labour to the successful carrying on of the sugar industry, that even in the West Indies, with their large creole population, Coolie immigration has to be carried on on a large scale. British Guiana, making about 110,000 tons of sugar, has a Coolie population of 100,000. Queensland, making 120,000 tons, has a kanaka population of about 7,000. It may interest some to learn that during ten years the births of kanakas in Queensland were 482; the number returned to the islands was 415, leaving only 67 unaccounted for, of which number death must have claimed some. Under favourable conditions, Queensland must soon seek a market for her sugars beyond the Australian colonies, and enter into competition with other sugar-producing countries in the world's markets. Let us compare the labour conditions of Queensland with those of British Guiana. I select that particular colony because I have resided there, and can speak from experience. In Queensland, the kanaka is introduced for three years, the whole of the expenses of introduction being borne by the introducer. The cost of introduction and return passage is £30, which, divided over three years, equals £10 per annum. Of this sum £24 has to be paid in advance, and a bond with sureties given for the return passage money. In British Guiana the Government introduces the Coolies for the planters (who, unlike the farmers of Queensland, are all wealthy men). The cost of introduction is £10, only a portion of which is paid by the planter, the payment being extended over three years. The term of indenture is five years, the cost of return passage, which can only be claimed after ten years' service, is, say, another £10, or £20 in all, which, divided over the ten years, is £2 per annum—just one-fifth of what the Queensland farmer has to pay. In all other sugar-growing countries, all work is done by contract, the labourers providing their own food. In Queensland the kanakas get both rations and wages whether they work or play. I have known instances of kanakas being sick for eighteen months, yet every six months, when the inspector visited the estate to witness payment of wages, this islander had to be paid the same as those who had never lost a day. It is extremely hard and most unjust that we should not only have to provide a sick islander with food, medical attendance, and medicine free of charge, but pay unearned wages also. The S.S. Islander in Queensland is protected in a manner which the most democratic Government on the face of the earth would never dream of extending to the white man. Many delegates to the Garton Conference could scarcely credit the statements made by my co-delegate and myself with reference to this labour and the iniquitous burdens placed upon their employers. Some of you were there and heard the statements. I am now here before you, and am prepared to more than justify every statement I then made. I trust, gentlemen, that during your stay here you will embrace the opportunity of making yourself personally acquainted with this most important phase of our troubles. My suggestion is that the term of indenture be extended to five years. This, while doing wrong to

no one, as the labourer can accept or refuse the term just as he chooses, would very materially lessen the cost of introduction, which is most excessive, and to many prohibitory. I would also suggest that larger discretionary powers be given to the chief inspectors for the various districts, so as to allow them to decide all cases on their merits. The grounds upon which I base my suggestions are: That for the first twelve months the S.S. Islander is of very little use and requires great care and consideration. That no cane farmer dare enter upon cane cultivation without making provision for labour. That all agreements to grow or crush cane are made for five years and upwards, and last, but not least, on the grounds that the price paid to the farmer for his cane depends upon the price obtained for sugar, which in no way depends upon the cost of production, but is regulated according to the price at which brokers and refiners can land sugar from China, Java, or the Mauritius, where labour is plentiful and wages nominal, or the cheaply produced, bounty-fed, freight-subsidised beet sugar from Germany. It may be said that five years is a long period. I do not think so, and I can speak from experience, as before I had arrived at the age at which a S.S. Islander would be permitted to come to Queensland I had entered into an agreement to serve Her Majesty for twelve years and four months, and fourteen years and four months if required, for less than half the pay and half the rations a kanaka gets. It will be said that to carry out my very reasonable suggestions it will be necessary to bring the Pacific Islanders Act before Parliament, and that the Labour members would seize the opportunity to deprive us of the labour altogether. This would be asking for bread and getting a knock-down blow with a stone with a vengeance. To my mind it seems a most unnatural and deplorable state of affairs that the miners and bush workers who depend so much on the producers and have so much in common with them, whom Nature intended and circumstances demanded should be our allies, should be so bitterly opposed to us for no other reason than that we require a little special legislation of which they have no need. This unfortunate state of affairs will not only continue, but will become more intense unless we take steps to dispel it. I trust something will be done in this direction at an early date. Opinions must not be hastily formed on isolated cases. I could take off my cane crop this year without the aid of alien or other labour, but I should be a scoundrel were I to use my peculiar circumstances as a plea for the discontinuance of that labour. I would also remind you that the planters' troubles were greatly intensified some years ago by the attempt to force upon them certain conditions, because they had been found possible by one individual who enjoyed peculiar advantages both of climate and situation compared with his compeers in the North. Dairying requires labour, and with the present insufficiency for proper cultivation and harvesting our cane, where is it to come from? It requires more labour in this district than in the South, for where the Southern farmer gets from 4 to 10 lb. of butter per week we get from 1 to 2 lb. only. It is one thing to milk one cow for 20 lb. of butter per week and to have to milk ten for the same quantity. Again, I may be permitted to say that the first suggestion made for holding these conferences was made by myself. I desired to see a closer relationship between the farmers of the North and South, and to see them all working together earnestly and vigorously in the interests of the producers generally. I had the honour to be the first cane farmer to address what a leading Southern paper described as the most important and representative gathering of farmers ever held in Queensland. Many little explanations had then to be made, but I am satisfied that in a great measure my desire has been achieved. Whether any direct good has accrued to the sugar industry from these gatherings is not for me to declare, but this much I can and must say: That to-day both the cane farmers and the sugar industry have many warm, sympathetic, and staunch friends in the South which neither had two years ago. In proof of this statement I need only point you to the eloquent and earnest appeal made by Mr. Deacon, of Allora, to the delegates at the Rockhampton Conference to support a resolution moved by myself, asking for the imposition of countervailing duties on beet sugar, which resulted in every delegate with one exception (who would not vote against it), voting for it. The very fact that he is here again to-day with us shows most conclusively that his association approved of his action on that occasion.

I am sanguine that much good would result if delegates from the miners and bush unions met the producers to discuss matters of mutual concern and debate any or all of the causes which have tended to separate us in the past. Some of you may fancy from what I have said, and the feeling manner in which I have said it, that I have much to lose and much to dread. Such, I am happy to say, is not the case. My concern is as much for the interests of Queensland as for those of the sugar industry. When I see danger ahead I act promptly and decisively. Directly the Pacific Islanders Act of 1884 came into force, I ceased to plant cane, planting none for nine

years. Never mind how this affected myself, let us see how it affected those whom it was intended to benefit—the wage-earners. In 1884 and in the preceding year, I sold to Paget Brothers 6,253 tons of cane on the field. It cost them in wages £1,407 1s 6d. to cut and transport to their mill. In 1890 and in the following year I sold them my crops also—75 tons 9 cwt.; my wages bill was £14—the one-hundredth part of what it ought to have been. I may say that these figures were not prepared for this occasion, but were supplied in 1891 for quite a different purpose to that to which I have now put them. Some people ask, What is the difference between cane and ordinary farming? That the former must have certain labour which is not necessary for the other climatic conditions, is in itself an ample reply to this question, but there are also many others. During the last thirty years, the ordinary farmer has been aided in a remarkable degree by mechanical contrivances. But notwithstanding the large rewards which have been repeatedly offered in the old cane-growing countries, where there is no labour problem to be solved and the certain fortune which awaits any genius who shall accomplish it, so far, a cane-cutting machine has baffled mechanical skill. Many in this room remember when all grain crops fell to the sickle. In America, the scythe and cradle enabled the reaper to do much more work. In Canada I worked one of the first reapers and mowers. These machines required two men—one to drive and one to rake the table. In a short time the self-raker reduced the cost of reaping by half, and after a few years the present reaper and binder was invented, with which one man now does the work which thirty years ago required from twelve to fifteen hands. The reaping of cane has to be done to-day just the same as it was done 100 years ago. Cane requires constant attention from planting to reaping. It is an exceedingly bulky crop to handle, and unlike grain, root, and fodder crops, it cannot be stored. The raw material must be converted into the marketable article within twenty-four hours, besides which, planting, cultivation, and harvesting have to be carried on at the same time. Where a farmer could cut and store 100 acres of wheat in about ten days it would take a cane farmer with fifteen men, nine horses, and three drays 100 days to harvest 100 acres of cane. Few ordinary farm crops occupy the land for more than, if so much as, six months. I know that many of you suffer terribly from drought, rust, aphids, caterpillars, mildewed hay, and sprouted grain. Generally, however, some use can be made of the damaged crop and a succession crop put in. The cane farmer has to contend with rust, gum, grubs, cyclones, &c. These enemies generally attack the cane just before maturity, which renders the crop absolutely useless, and when to this is added the fact that the removal of a damaged cane crop costs almost as much as the removal of a sound one, and that a cane crop represents from twelve to twenty-one months' labour, I think you will agree that, in common with you all, the canegrower needs no artificial woe. You will not be surprised that with so many natural and unnatural difficulties to contend with some of us have looked for a way of escape. I did so, and I will give you the results of the experiment. Unlike any other section of the community, the farmer, although overwhelmed with his troubles, cannot take up his hat and walk, he must stand by the old land and try other crops. Knowing something of fruit cultivation I decided to try limes. Friends assured me that there would be no sale for the fruit, and that the manufacture of limejuice was a trade secret. Undeterred, however, I planted 1,200 lime trees and attended to them well. Some time afterwards I read a leading article in the *Queenslander* headed "A Fortune for someone in Limes." I regret to say that it appears to be reserved for some perhaps less enterprising person than myself, for when in due course the fruit arrived, the united efforts of the gentleman presiding over this Conference, who took a keen interest in my venture, of the Under Secretary for Agriculture, who went to great trouble, and myself, failed to find a market for these. I then attempted limejuice. Here is a sample, judge for yourselves if it is not equal in appearance (which is a great thing in all manufactured articles) to the imported article. I am confident that no purer limejuice was ever put into a bottle, as I did the whole of the preparing myself, and I can further assure you that pure limejuice cannot compete with chemical. An enterprising neighbour next approached me with a view to getting limes for pickling. I told him to take what fruit he required and to give what he chose for it. He made pickles, distributed a large number of bottles gratuitously to advertise them. They were declared to be good; he placed them on the market and found no sale for them. Yet, in Crosse and Blackwell's list, lime pickles are quoted higher than any other. The same thing applies to mango chutney and many other colonial manufactures. Quite a number of self-constituted, censorious critics, full of chemistry, but devoid of common sense, never tire of telling us that chemical control would free us from half, if not from all, our troubles. Science is good, but the little science many of these possess is a very dangerous thing. One tells us through the Press that, in some instances, as much as 40 gallons of molasses remain after final boiling, and seems to have at least convinced himself that the manufacturers' salvation would be assured if this were converted into

sugar, which so far has proved an impossibility, even in the laboratory. But the real facts are, that though there may be a residuum of 40 gallons, half of it is water used in machinery and which never at any time formed an element of the cane, and has no right to be taken into the calculations. The legitimate use of molasses is distilling for rum. The manufacturers say rum is unsaleable. I know that limejuice is, but here is a blending of both which I think would find ready sale. Taste it and declare. [Samples produced.] The point I wish to emphasise here, is the immense annual loss to producers by reason of their inability to find a market for products which should be saleable. I would suggest that a large column be provided in our statistical returns for losses from all causes. These figures would soon claim the attention of those in power, and speedily lead to the appointment of a Minister for Trade and Commerce, which is an absolute necessity in an essentially producing country like Queensland, and which has tended in a remarkable degree to the commercial prosperity of Canada. This would mean a £1,000 billet for some, but if wisdom dominated the choice and the individual was chosen for his ability and business acumen, and not for political services rendered or possible opposition to a political party, it would mean an annual saving of about £500,000 to the producers of Queensland. Reverting to molasses, I have had as much as 60 gallons of molasses to a ton of sugar, and I know that a chemist could not have reduced the quantity, but I also know that the farmer could have reduced it by half. The chemist can only say what sugar is in the cane; it is the farmer who puts it there. The quantity and quality of sugar and the quantity of molasses depends entirely upon the treatment of the cane in the field. "Sugar is made in the field," is a household word in the old cane-growing countries, and I am pleased to see that the growers in Queensland are being seized of its importance. The future of the industry in Queensland, as far as the growers can influence it, lies in the field, not in the building. It is to the field they must look for their profits, and they have big possibilities there, to which those of the building are nothing. Look at these two canes! This one is eight months' old second ratoons, the first cane to arrow on my place this year. This one is plant cane twelve months old. Both are of the same variety. [Samples produced.]

The difference in them is not a few gallons of molasses per ton—it is tons of sugar per acre. But I must not stray with cane cultivation, neither do I wish to create the impression that the chemist is an unnecessary adjunct to either successful cultivation or manufacture. I think him indispensable, but I maintain that practical experience is of equal importance. It is the practical man who puts the teachings of science to the test and determines its value; and another thing, scientists often hold widely different views. Many years ago, Liebig either said or was understood to say that the ashes of manure were equal in value to the bulk. Lanes and Gilbert promptly put this to the test. They burnt 14 tons of manure and applied the ashes to one plot and the manure (unburnt) to another, which quickly and conclusively proved the fallacy of the theory. I was much surprised to read, quite recently, that the reason given for closing an agricultural college was owing to drought. It is really under such conditions that science should strive. I was, however, also much pleased to see that the committee of an agricultural college called for applications from practical men to take charge of it. I am pleased to see that our Department of Agriculture recognises the value of practical experience. Some connected with the sugar industry see prospective prosperity in federation; I see none. We are told that we shall be protected. Caricature often appeals much more eloquently and forcibly to the mind than words. Here is one from an old Queenslander, in which is depicted these middlemen taking the products of an emaciated producer with one hand for a penny, and handing it over to a chance consumer with the other for twopence; such is protection. As another delegate has a paper on this subject, I will only ask you all to remember that in the sugar industry alone there is nearly £5,000,000 sterling invested; that it supports 22,000 people; that last year it disbursed £1,000,000 sterling to wage-earners; and that its extinction, which is threatened by federation, would sink its immense capital, and force those at present supported by it into competition with miners and others, the inevitable consequences of which would be a very serious reduction in wages. The combining of dairying with canegrowing is just now attracting considerable attention, and is favourably viewed by many canegrowers. That this is possible in exceptional cases I am well aware; I am even ready to admit that, on a small scale, I do it myself; but that it is possible of general application, under existing conditions, I very much doubt; it is not congenial work to the ordinary labourer. They dislike the early rising, the monotonous milking morning and eve, wet or dry, Sunday and working day. Some say, "Oh, but the women and children can do the work connected with dairying." If there is any individual in the whole community of Queensland who requires to be relieved of a portion of their present burden, and who are utterly incapable of bearing any further impost, it is the cane farmer's wife in North

Queensland, many of whom are not in a position to obtain very necessary domestic help, and are debarred from using that which could occasionally be made available. This is very seriously affecting the proper education of farmers' children, many being compelled to work at a very early age. Concern is being felt because the favourite Berkshire pig is deteriorating, getting heavy in the shoulder and neck, which are cheap, and light in the loin and hams, which are the best paying parts. I would like to draw the attention of the Government to a much more serious fact—namely, that the constitutions of the married women of North Queensland are being undermined in an alarming degree, in some measure by climatic influences, but in a much greater owing to the insufficiency of domestic help. An eminent doctor in Sydney, with a large experience in this matter, quite recently said to a lady friend of the writer, "I do not believe there is a thoroughly sound married woman in North Queensland. I do not know how a woman can live there, they have to work too hard." I commend this matter not only to the Government, which can and should make the necessary help available, but also to those women in Queensland who make their sex's interest their chief care and study. It is pretty generally admitted by all who have tried them that cane tops have no value in milk producing, although they tend to fatten. It is said dairying would furnish very necessary manure for our canefields. The gathering of the tops would require considerable labour in the midst of crushing. Where it would come from I don't know, but this I do know: that the trash could be buried for less than it would cost to remove it, and that it would be much more beneficial to the land than the leached stockyard manure, which might or might never be returned to it. Gentlemen, I can quite imagine the thoughts in your minds from these remarks—namely, "Oh! Denman feels towards dairying as some feel towards canegrowing." My remarks have not been made in a captious, but a kindly cautious spirit. I have tried to think out this solution. I know that a large quantity of natural herbage is now going to waste in this district. I know that the best results ever obtained by our esteemed friend Mr. Mahon with his travelling dairy were obtained in Mackay. I am satisfied that dairying will, in this district, help very considerably to revolutionise the sugar industry and establish it on a much firmer basis, render it more profitable to all connected with it, and do more towards solving its most serious problem, which has so far defied the efforts of all who have attempted it. But, gentlemen, the only means by which this can be accomplished will be by the construction of light agricultural lines, which will not only tend to close settlement, but, as in other countries, will prove very profitable work. At the present time, owing to the want of cheap and quick communication, our cane supply is confined to only a small portion of our available land. Dairying would be the primary industry of the settlers owing to the fact that it costs much less to start than canegrowing, and brings in a regular weekly revenue instead of having to wait eighteen to twenty-four months for their first returns, which means heavy interest, and in many cases an extra 25s. on goods obtained during the interim. These settlers would soon enter upon cane cultivation, having an assured market for their product, but instead of, as at present, having one man growing 50 acres for an average return of about 14 tons per acre, we should have five men growing ten acres each, yielding from 25 to 30 tons per acre. This would, in all probability, lead to a system of co-operative cane cutting. Many who now hold their farms for canegrowing only, would then be released from those conditions and allowed to combine dairying with their cane cultivation. In these times of fierce and unfair competition, mills must be worked to their fullest capacity if the present price of cane, which permits of no reduction, is to be maintained. In America and Canada the settlers go to the railroad, and towns and villages quickly spring into existence. In Queensland, an inverted system obtains, the railway goes to the settlers, but as a general rule not until half of the original ones have had to abandon their holdings for want of it. The chief requirements, not only of the farmers, but of the colony generally, are labour, capital, and railway communication. Separately each is useless: united they are a sure avenue to success. I regret to say that some people in this colony have made the building of barriers between these three their chief aim in life. I appeal to every man and woman in Queensland in their own interests, and in that of their native or adopted country, to do all in their power to bid this state of things cease, for in the future, as in the past, the only things which can possibly accrue from it with anything like regularity, so long as the people tolerate such a state of things, are distress and disappointment, and Queensland must yearn in vain for either close settlement, commercial prosperity, or national expansion.

On the conclusion of Mr. Denman's paper, which was warmly applauded by delegates, it was referred to the Resolutions Committee, as owing to its comprehensive nature it was considered it would be impossible to discuss it immediately with justice; and the discussion on it, as well as on the following papers of Mr. Pott and Captain Henry, was postponed to Thursday morning.

Mr. GIDEON W. POTT (Proserpine River, Bowen) then read the following paper:—

THE LABOUR PROBLEM IN CONNECTION WITH THE SUGAR INDUSTRY.

In reviewing the progress of the Queensland sugar industry since its inception, we cannot fail to be impressed with the vicissitudes through which it has passed, owing, to a very great extent, to the difficulty experienced in obtaining the requisite labour to enable the industry to be profitably carried on. Since the repeal of the Act prohibiting the importation of kanaka labour, the industry has enjoyed a respite from the harassing labour difficulty, and being able to obtain a supply of suitable, fairly cheap, and, above all, reliable labour, has been carried on profitably in spite of a series of by no means favourable seasons. To those who have watched the trend of events in Queensland and have listened to the voice of public opinion, it is clearly apparent that our industry will soon have to face probably the most severe crisis it has yet undergone, caused by her stoppage of the present supply of coloured labour; and it is with the object of hearing the effects of such a crisis thoroughly discussed that I have undertaken to write this paper, giving my views upon the subject and showing what I believe and hope will be the ultimate solution of the difficulty. The question which is apparent in the minds of most sugar-growers, in connection with this subject is—Can our industry be profitably carried on without the aid of its present supply of coloured labour; and if so, what substitute can be found to take its place? Confronted with this question, it will be instructive to review the labour conditions under which the industry has been carried on since the Sugar Works Guarantee Act came into operation in 1893. When money was advanced in 1888 * by the Government for the two experimental central mills, Racecourse and North Eton, a condition was attached that no labour except European should be employed either in the mills or in the fields. For four years this condition was faithfully observed by the farmers growing cane for these mills, and it was proved that during that period the uncertain supply and utter unreliability, coupled with the high price of the obtainable white labour, rendered it impossible for farmers to extend their operations beyond that amount of cane which they could themselves cultivate without the assistance of outside labour. That the farmers themselves were strongly in favour of white labour was shown by the fact that, even after the aforesaid restriction was removed, and other central mills had sprung up, many farmers voluntarily abstained from employing coloured labour, giving the preference to the expensive and unsatisfactory white labour obtainable. In 1894 the farmers growing cane for Homebush Mill in Mackay district protested through their association against contracts for cutting cane being let out to contractors employing kanakas, and urged members as far as possible to give their cutting to white men. The average price paid that year for cane cutting and loading to white men in Mackay was 3s. 3d. per ton, and even at that figure, which was profitable to the cutter, the greatest difficulty was experienced in getting the men to carry out their contracts. That the aforesaid figure is a profitable one for cane grown upon forest land, no experienced contractor will deny. In the Proserpine district, which I have the honour to represent, a large area of cane was taken off last season with a gang consisting mainly of white men, at a cost of 2s. 6d. per ton, paying 30s. a week to every hand employed. I have known many instances of working men from the Western country, staunch unionists and rabid anti-coloured labour men, taking up farms in the Mackay district and elsewhere, and employing nothing but white labour even at a rate 40 per cent. above that paid to kanakas, and, in every instance that I have known of, these men were forced, against their sincere convictions, to employ the kanaka, not because of the high wage of the white man, but owing to his utter unreliability. That most men *can* work in the canefield, and in fact do all the work attendant upon canegrowing without injuring their health or suffering serious inconvenience from the heat, has been clearly proved; and that the industry can pay a fair wage to suitable white labour I am firmly convinced, but that the present supply of white labour in North Queensland is either satisfactory or in anywise adequate to take the place of our present coloured labour, I emphatically deny, while to make the farmers dependent on such would be to utterly ruin one of the most flourishing of Queensland's primary industries. The white labour which at present makes its appearance in the canefields at crushing time consists for the most part of the typical sundowner and swagman, ready to accept any sort of job and earn his £1 a week as easily as possible, and to spend the same at the nearest public-house, leaving his employer at a minute's notice short-handed at his busiest and

* The first advance to the North Eton Central Mill was made on 28th October, 1886, and to the Racecourse Central Mill on the same date.—Ed. Q.A.J.

most critical time, to loaf his way to the next district and repeat the foregoing. We also obtain the refuse of the southern cities, wrecks of humanity who, tempted by the prospect of good wages, work their passage to the Northern ports, and endeavour to force their vitiated bodies to perform work for which they are utterly unsuited, and ask for increased pay, by reason of the injurious effect of the climate upon their decayed constitutions. It is for the sake of these men, and others like them, that southern politicians would cripple an industry that enables thousands of energetic hard-working men to better themselves by settling on the land with their wives and families, and peopling this great colony with a prosperous agricultural population, so essential to the prosperity of a young country like ours. Why, I ask, should the sugar industry be asked to pay wages nearly 50 per cent. higher than those paid by any other agricultural industry to a class of labourers inferior to those employed in any other industry? Is sugar-growing so profitable? Ask the farmer who works from daylight to dark, year in and year out, and is contented to make a fair living and eventually to purchase the freehold of his farm, if such is the case. Sugar-growing is not more profitable than other branches of agriculture, neither is the work done by its labourers any more laborious or requiring more skill than any other industries. Rather, indeed, the reverse, when we consider that for the greater part of the year the work done by kanakas merely consists of hoeing and planting cane and general light farm work, and I speak from experience when I say that the labour involved in harvesting cane is lighter than that of any other agricultural product. That white labour can be profitably employed by the sugar industry, provided it be of a reliable kind, and can be obtained at the wage at present paid by our farmers in other branches of agriculture further South, I firmly believe. Where, then, are we to look for white labour suitable for our requirements, and at a wage which, although necessarily higher than that paid to kanakas, will still be lower than the present price of white labour?

It is in Europe that we shall find the labour we require. In Great Britain, Germany, Denmark, and other European countries we can find a class of farm labourers, thrifty, sober, industrious, accustomed to long hours of steady toil and paid at a rate of wages in many cases below that paid by us to kanakas. The conditions under which these men work prevent them from raising themselves from their miserable situations as farm labourers, and the position of independent settlers, within reach of every white man in Queensland, can never be theirs. Let the Government assist these men to pay their passages out to the colony, and let their wages be fixed by us at a rate that our industry could profitably pay, and they will eagerly make use of the opportunity vouchsafed them of obtaining a wage greatly in excess of that which they have been accustomed to, with the prospect of ultimately making a home for themselves and becoming eventually independent. That the necessarily increased rate of wages, caused by such substitution of labour, will render sugar-growing less profitable than at present is, I admit, probable, should such a change take place immediately; but signs are not wanting which point to a complete revolution in the conditions of sugar-growing, caused by the introduction of labour-saving machinery, similar to the effect produced upon other agricultural industries by the use of machinery. The application of mechanical means to the planting, cultivation, and harvesting of cereals and other products (amongst them the sugar-cane's great rival—beet) has so completely revolutionised these industries, that in spite of the tremendous fall in prices during the last ten years, these can still be profitably produced. We hear of the impossibility of machines being used in the harvesting of cane, but what seemed more improbable twenty years ago than the idea that a machine drawn by two horses and driven by one man, could do the work and take the place of twenty or more labourers in the wheat field? Who could have foreseen at that time the possibility of shearing sheep by steam power? History will repeat itself in the case of our industry. Already we have a machine for planting cane which, when perfected, will enable one white man to do the work of half a dozen kanakas, and the day is not far distant when a machine will be produced to take the place of the large gangs of coloured labour at present required in the fields in the crushing season. By these means the farmer, by reducing the number of his employees, will be enabled to pay good wages to whatever white labour he requires, and our industry will no longer be dependent for its existence upon a supply of cheap labour so distasteful to the white population of Australia.

On the motion of Mr. PEEK, Mr. Pott's paper was also referred to the Resolutions Committee.

GREEN MANURING.

Mr. P. McLEAN (Under Secretary for Agriculture) said: This subject of green manuring is on the programme for discussion, and I may say it is one of the deepest interest to those engaged in the sugar industry. Seeing also that a

very heavy order has been placed with the Department from this district for a supply of cow peas, doubtless some of the sugar-planters here will be prepared to open the discussion on this question of green manuring. It is a question that deserves every consideration at our hands, and not only at the hands of those engaged in growing the cow pea for manuring, but also for the general farmer. For although the Agricultural Department introduced the cow pea, yet when it came to grow it itself, it had to pay £2 2s. a bushel for the seed, and at the present time there is an open market for cow peas at 10s. a bushel.

Mr. WM. GIBSON (Bingera) : We have been growing cow pea at Bingera, and at present we have something like a ton of seed sealed up in tanks for planting in the early part of the season, and this doubtless will show practically our opinion of the benefits likely to be derived from cow peas. With us it is no longer an experiment. We are convinced of the efficacy of cow pea in its increasing the fertility of the soil. As all who are interested in the cultivation of the soil are aware, there are patches of ground each year that require to be fallowed, and they also know that some change of crop requires to be put into the ground. Our experience teaches us that in fallowing the land for the ground to be benefited, it is necessary that the soil should be covered from the rays of the sun with some crop, even if it is only grass, but more frequently with something in the form of cow pea to add to the nitrogen that has been taken from the soil by some previous crop. Cow pea gives us better results by a little addition to the soil of superphosphate previous to the planting of the cane, and with the facts at present before us we are determined to continue with the cow pea, with the addition of the superphosphate, before planting the cane, wherever practicable. In conclusion, I may say we are quite convinced that the cow pea is of benefit, not only for its nitrogen, but for the shading it gives the soil, and that it is one of the cheapest and safest ways of recouping the soil from the effects of previous crops.

Mr. E. SWAYNE (Mackay) : On behalf of the Mackay district, I should like to bear out what Mr. Gibson has said. We have found green manuring most beneficial, and in fact I think no land should be replanted with cane unless cow pea or something like it has been ploughed into it first. We find so far that cow pea is better on the lighter soils, but on others, perhaps, the Mauritius bean is still better. The latter has a more rampant growth, although it takes longer to grow. Last year I planted cow pea on a piece of land with the exception of a plot in the middle. The cane now on that plot is giving a much lighter crop than the rest of the field where the cow peas had been, and there are more misses on it, as well as more weeds. Of course the cow pea is responsible for the superiority of the balance of the field, for it both acts as a manure and cleans the land. As for the manuring of cow pea, of course it does not require a nitrogenous manure. It seems to require potash especially. A small experiment that we are carrying out proves that the application of one hundred-weight of kainit to two hundredweight of bonemeal, increases the yield of cow pea 25 per cent. Bonemeal gave no better return on unmanured land, but of course my experiments are by no means conclusive. A neighbour of mine has asked me to bring up the question of the difference in the quantity of nodules on the roots of the cow pea in different classes of soil, and whether it makes any difference in the nitrogenous value of the cow pea if the nodules are absent.

Mr. WM. THOMPSON (Childers) : In 1897, I planted 3 acres of cow peas and 3 of vetches, but found that during the heat of the summer the vetches died away completely. The cow pea, however, grew very luxuriantly, and was ultimately ploughed under, although we had some little difficulty in this latter connection, having to use a chain in the process. Cane was then planted on the land as well as on an adjoining piece of ground, and I must say there was no earthly difference between the cane on the land where there had been cow pea and where there had been none. Perhaps the Isis Scrub does not want cow pea, or perhaps it is only good for wornout land. I have no doubt that as the land

grows poorer it will be beneficial, but where the land is rich I do not think cow pea is of much use. We thought if we put cow pea on to the land, the cane crop would be the same as from virgin scrub, but up to the present this has not been proved to be the case. This of course refers to Childers in the Isis Scrub. Mr. Gibson has been growing cane on his land for a number of years, and perhaps in his case the cow pea is beneficial. My cow pea was eight weeks old when it was ploughed under.

Mr. J. C. BRUNNICH (Agricultural Chemist): There are a few points, Mr. Chairman, which have sprung up in the discussion so far, and to which I may be permitted to refer. It is little use thinking that if land is worn out, cow pea will recoup it, and Mr. Gibson's remarks show this to be the case. I know for a fact that the land Mr. Gibson refers to is particularly poor in phosphoric acid and nitrogen. Cow pea will supply one deficiency, but, to get proper results, he adds superphosphate to it. This shows that you must apply the other manure to secure the best effect from the cow pea. Mr. Swayne, on the other hand, advocates potash along with cow peas. Well, I know the land about here is poor in potash, and this shows that a grower must use his judgment in the selection of another manure to derive the full benefit from cow pea. It will be very injudicious for a farmer to pin his faith on cow pea alone. Cow pea in this district may be good, but in other districts other plants may do better. There is the Mauritius bean, and it is only by small experiments that the farmer can discover which is the most suitable for his requirements.

From experience I know that there is not a very great difference in the manure-giving qualities of these particular crops themselves. There is not much difference, say, between the Mauritius bean and the cow pea. The principal point is that it should be luxuriant. With regard to Mr. Swayne's question about the nodules: The nitrogen is contained in the nodules, but I may tell you it is not easy to find these nodules. In some cases they are easy to find, but in others they are not. If you pull up a plant you will probably leave most of the nodules in the ground. To observe them properly, the plant must be taken out very carefully, and the soil removed very gently from the roots, but you can be sure, if there are no nodules, that very little nitrogen has been assimilated by the plant, and that you can only think the soil is really very poor. In some places, the germs which are necessary for the making of nitrogen are quite absent, and some scientists make a preparation which they call *nitragin*, which they inject into the soil for the purpose of producing those germs in the soil in order to induce a more luxuriant growth in leguminous plants. It is quite possible if you find a patch where the cow pea will not grow properly, that the reason is that these germs are deficient. But if other cow peas are growing on adjacent land, the probability is these germs will be disseminated by them. You must not think that cow peas alone will save your soil, but you will probably get good results from it hand in hand with some other manure. We tried the Velvet bean at the College, and got 10 tons per acre, very rich in nitrogen, but deficient in ash. We have also tried the Black bean and the different kinds of cow pea, and I would advise other farmers to do the same in order to find which is the most suitable for their own particular soil.

Mr. T. MACKAY (Cairns): Some 7 or 8 years ago I got a small parcel of cow peas from the Kamerunga State Nursery. I planted this in the month of August, and got as a result a very plentiful crop of seed. From that I planted 3 or 4 acres on the commencement of the wet season—namely, in January. On this occasion the cow pea ran all over the ground, covering it up beautifully. I afterwards moved the crop, and saved it by stacking it, and found that it made a first-class fodder. I cut it into chaff for which purpose I found it excellent, and afterwards when the crop was off I sowed oats on the land. This was in April, and I secured a really excellent crop. I afterwards found out two things—namely, that if you want cow peas for vines, you must plant in the commencement of the wet season. If for seed, plant in the spring. They will not run to vines then. If I had known that 10s. per bushel could be obtained for cow peas I should have gone in heavily for them. As a manurial plant it is extremely valuable,

and its mechanical effect on the soil is also most beneficial. In many cases we often apply manures to soil without any apparent benefit. For instance, if the soil be rich or full of constituents necessary for sugar-cane, very likely the application of manure would not give any apparent result, while if the soil is deficient we see the result. But in all these things the great benefit from the cow pea would be from its mechanical action. It makes the ground more porous, and I found that when, in the wet season, ground is covered with a thick growth of cow peas it is protected from heavy rains, which are so apt to wash our soils away. With cow peas at the end of the wet season, the ground is in a beautiful state for a crop; in fact better than if you had cultivated it a dozen times over. I mowed my cow pea with a scythe, which, of course, was a difficult matter, but I could see no other way of doing it. Lately, people have gone pretty largely into cow pea, and the trouble has been the ploughing in. The disc plough, however, overcomes this, and they are now using this implement in the Johnstone and Cairns districts with excellent results.

Mr. L. P. LANDSBERG (Rockhampton): Our experience in the Rockhampton district in the matter of the time of planting cow peas is quite opposed to that of the last speaker. We find, if we plant in the Spring, that the cow pea runs all to vines, which is exactly opposite to Mr. Mackay's experience. We find that, for seed purposes, it is best to plant just before the wet season. As a fodder I do not think the cow pea has an equal, especially for dairy cattle. Before I started using the cow pea, I was feeding my cows last winter with bran and ordinary chaff (oaten and panicum), but I did not get anything like the result that I am this year getting from cow peas. Last year my returns did not average more than 2 lb. of butter per cow; but this year, thanks to the cow pea, the return has been increased to 4 lb. per cow. The great advantage in the cow pea for green manuring is its rapid growth, and I have found that you can plough it in within from 3 to 4 weeks after sowing. Again, if you plant cow pea in the Spring, you can cut it four or five times before it matures, which it always does at about the same time, irrespective of when it is planted or how often it has been cut. I have planted some in August and some in January, both plots maturing at the same time—viz., April. I got 5 tons of green feed per acre, and as it was dry weather the whole time, it came in very opportunely for the dairy cattle. The cow peas were cut with a scythe.

Mr. B. O. BROOKES (Johnstone River): On the Johnstone we go in for cane, and cane only, so green manuring is only aimed at when we plant crops like cow peas. We find, however, that the Mauritius bean makes the best green manure with us. In the first place, it is considered a heavier crop, and, again, it takes longer to mature than the cow pea. Under ordinary circumstances we plough out in November and December, and owing to the wet season we are not able to plough in until April or May. With us, as far as my experience goes, the cow pea matures in about 8 weeks, which is too early. You can let the Mauritius bean, however, run 16 or 18 weeks and then plough it under. As to the advantages to be derived from green manuring, they are too patent almost for discussion. Although it is only of late years that we have gone in for it, we now look upon it as part and parcel of our yearly work. Every field has its due rest, and along with it its green manuring. In some districts where they have forest land, I should imagine they will require probably something in addition, say some strong artificial manure, but with us we have found that green manuring applied about every third year, planted and ploughed under at the proper time, gives us a 50 per cent. improvement, certainly 35 over the old method. Our land is fairly new, and we are opening up fresh land every day, but we do not think of manuring until the fifth or sixth year—i.e., when the stumping takes place.

Mr. N. J. MIKKELSEN (Avondale): I think it is a great mistake to consider that green manuring is beneficial everywhere. We all know that with green manuring we restore nitrogen, but it is nitrogen only, although, of course, it may be beneficial owing to its mechanical effects. I tried some cow pea last year, and, in the cane planted on the same land, there was no difference

as compared with that on the other fields alongside, plainly showing that cow pea did that land no good. I think what is wanted is a really smart agricultural chemist in all the centres of agriculture. What is the use of telling us to put in cow pea if it will not be beneficial? If we could get a pocketful of soil and hand it to a chemist to tell us what it contained, and what it was short of, we would get on much better. At present we go headlong into matters of this kind. We see our cane flagging, and then apply a lot of manure to the soil. The next crop comes along, but we see no apparent result from the manure. Why? Because the right kind of manure was not used. Some time ago we had a meeting in Bundaberg, and it is pretty well decided that we shall have a good chemist there. A poor one would be of little use. The way in which we propose to raise the capital is to tax the manufactured sugar, and also the cane grown. Mr. Angus Gibson's idea is to tax all cane grown $\frac{1}{4}$ d. per ton, and all manufactured sugar 2d. per ton. This should produce £1,800 a year in the Bundaberg district, and we are also looking forward to a Government endowment to the fund. Mr. Chataway can thus see we are in earnest in the matter, and I hope you Mackay people will follow suit in this connection.

Mr. R. GIBSON (Ayr): If ever the Agricultural Department did something useful, it did so when it introduced the cow pea. It is about the best feeding plant that you can get for either man or beast. Personally, I find that they agree with me. Some time ago I planted potatoes on a piece of land that had cow peas on it as well as on an adjoining plot, and anyone with half an eye could see in the crop the patches where the cow pea had been. For horses, cows, and poultry, especially for the latter, the cow pea makes a splendid feed.

Mr. J. CROOK (Rockhampton): I do not go in for the cow pea as a green manure, but as a general crop. I originally got a packet of seed from the Agricultural Department, and have grown it ever since. I find it is a great crop for enriching the soil, and also for killing weeds. This year I had 13 acres of it, and afterwards I had only to plough the land once. I had no weeds to contend with all the time the cow pea was on the land. It kills everything it comes in contact with, and there is no trouble in cultivating the land when the cow pea is taken off. It makes a splendid fodder; everything will eat it—pigs, cattle, horses, and poultry. It makes a splendid chaff for horses. I have a piece of heavy black soil which can be worked as easily with two horses after cow peas have been on it, as with four horses if the cow peas had not been grown there.

Mr. W. D. LAMB (Yangan): As a Downs farmer I must say that I can bear out the experience of the last speaker as to the cow pea being a good fodder. Anything will eat it, cows or horses, and fowls will eat the seed. I have had considerable experience in the harvesting of cow pea seed, and last year prepared all the Agricultural Department's seed. This has shown me that the greatest difficulty in growing it for seed is the harvesting. The mower has been tried, I understand, and if we can get over the harvesting difficulty, I believe we shall be able to grow cow peas that will be useful for every purpose; in fact, they would probably take to a great extent the place of maize. As for leaving the land clean, there is not the slightest doubt of that. They put it into good condition for the following crop. There is one thing, however, that I find on the Downs, and that is, we cannot sow cow peas after Christmas for seed purposes. I sowed it last year in January, and it got caught by the frost, so we have only one season to deal with. Of course, on the Downs we do not want green manuring yet, but otherwise the cow pea is a really excellent crop. It makes capital hay if not allowed to get too ripe, quite equal to lucerne.

Mr. H. CATTERMULL (Woongarra): Some 3 years ago I grew 2 acres of cow pea and ploughed them in, but did not plant cane on the land, for the simple reason that it became alive with grubs. They are only leaving the ground now.

Mr. R. S. AIKEN (Gooburrum): I can bear out what the last speaker has stated. From a farmer's or canegrower's standpoint, the after effects of the cow pea are disastrous. Wherever the cow pea has been on the ground for a

number of years, that is where the grubs are thickest, and I noticed when passing one or two of the plantations here yesterday, that you are troubled with the grub or some other disease, because there is no doubt some of the cane is dying, and I would advise canegrowers to be very careful in reference to cow pea. It may be all right from a dairying standpoint, but I am quite sure it is all wrong from a canegrower's point of view. I would like to advise my fellow canegrowers in Mackay, if they try it, to only do it on a small scale.

Mr. W. DEACON (Allora): Mr. E. Swayne tells me that he has grown cow pea as a green manure for seven years in his district, and the cow pea land is freer from grubs than any other part of the district. I thought the discussion would have taken a more comprehensive form, as there are other green manures besides cow peas, and I should like to know their effect on the land. Rape, for instance, is, I think, more adapted to our part of the country than cow pea. There is the difficulty of harvesting the cow pea, and I have doubts as to its value as a fodder. I am told cows will not graze on it; in fact, that they do not care about it at all. Of course cow pea seed may be worth a great price, but it is most extraordinary that in the Northern districts, where you say you have a great want of labour, you can afford to use the scythe. We cannot afford to use the scythe, but must grow crops on which we can use the mowing machine. We have our labour difficulty, too, on the Downs. Then there is the threshing. Did Mr. Lamb thresh his cow peas with his machine?

Mr. LAMB: No.

Mr. G. MUNTZ (Mosman): I may say that, unlike most of the gentlemen who have spoken, in the district I represent there is not a single acre of cow peas. So far, we have had no necessity for green manuring, and I was pleased, up to a certain stage, to learn that we had discovered such a suitable manure as the cow pea, until the point was raised about the grubs, and I am now uncertain whether I should recommend it to my district on my return or not. Perhaps the same objection would not apply to the Mauritius bean.

Mr. W. TOFT (Rockhampton): I quite agree with the remarks that have been made relative to the benefits likely to accrue from the appointment of agricultural chemists in the various sugar centres. It is gratifying to learn that the Bundaberg district has taken the matter in hand, and I think other districts should follow suit.

Mr. J. E. NOAKES (Maryborough): The remarks of the various speakers so far, Mr. Chairman, show clearly that different districts require different manures, and from what Mr. Brooks has stated, the Mauritius bean is the best for the more Northern districts. As for the cow pea, I can bear out what Mr. Aiken says about it being a harbour for grubs.

The Hon. J. V. CHATAWAY: In summing up the discussion, I must first of all say that there seems to be some slight misunderstanding, and I shall refer to one or two small matters. The last speaker but one said they required to know the different manurial values of the beans—Mauritius, velvet, cow pea, Madagascar, &c. Mr. Brünlich has already told us that there is very little difference in the various beans of this class. But there is still a slight misapprehension, and it has not been clearly brought out, and it is that one end of the colony requires the cow pea in order that it may be ploughed under for green manure, and not in order that it may be gathered for feed. The seed must be grown in a cold climate, and must therefore come from the Southern end of the colony. The Northern planters have not had to harvest it with scythes, seeing that they ploughed it in. I may here say now that the Department has a greater demand for seed of the cow pea than it finds itself able to supply. With regard to the harvesting of the cow pea, which will always be done in the South, we have tried the mowing machine and found it wanting because it leaves 25 per cent. of the seed on the ground. The only way we have of harvesting is to lift the whole plant, cut with a hoe or similar implement at the root, and then lift it on to a dray. It has been suggested that the cow pea encourages grubs, and it has been pointed out that, in some parts of the district, some of the cane is

dying, and we are warned solemnly against using cow peas. First of all, it may be observed that this cane is dying from want of cow pea and other manures. Cow peas have been planted here for years, and it is possible where you plough them in, or where you plough in trash, that you make an attractive seedbed for the cockchafer, and in that place the cockchafer will lay its eggs. The result will be that the place is full of grubs, but it is not because the cow pea is there, but because you have made a nice spot for the female to deposit its eggs. The discussion has been satisfactory to us in one way at any rate. We have been told the Agricultural Department did some service when it introduced the cow pea. When out at Taroom the other day I found the cow pea there used as a vegetable; in fact, it was practically the universal vegetable of that dry region. Now, some of the representatives from the Bundaberg district spoke strongly on the need of agricultural chemists, the necessity for the analyses of soils, and about spending money in buying manures in the dark. It is funny the members who spoke did not seem to realise that we have already an exceedingly able chemist in the service of the Government, a man whose life has been practically devoted to agricultural chemistry; that his services are placed at the disposal of farmers and others who wish to have their soils analysed, at a price which is not in excess of one-fourth of the actual cost of the analysis. I think those who desire to have soils analysed should remember this. It is true it may be said that the Agricultural Department should analyse soils for nothing, but in that case it might keep a staff of from fifty to sixty chemists, and then never be able to keep pace with the work. For you must remember that the analysis of a soil is not the same as the assay of a bit of stone. Some analyses will cost as much as £50, and the average not less than from £8 to £10 if properly done. Now the Department is saying that it will do them for from 2 to 3 guineas. That is a fourth of what they cost, and I am surprised to hear gentlemen say that it is time we got decent agricultural chemists. With regard to the proposal made by the Bundaberg delegates about the establishment of a station in their district, I may say that is a matter that has been on foot for some time past. The Isis people last year proposed to find £250 a year, but Bundaberg now proposes to find something like £1,200—that, I believe, is the amount—towards the establishment of a station. If they complete that offer, it is certainly very liberal of them. But, mind you, I think the sugar industry itself deserves some sort of Government assistance of this description. We have, or have had, experts for every possible industry in the colony except sugar, I think. We have a viticulturist, a tobacco expert, and we previously had a gentleman skilled in the same product. We keep a large staff to advise on the comparatively small fruit industry, but up to the present the sugar-grower has had to get along as best he can. The Bundaberg people now, however, ask that we should assist in giving advice as to how they may help themselves. That is a most creditable position to take up; and we now propose to enter into communication with Mr. Maxwell, the head of the laboratory in Honolulu, and the most successful agricultural chemist in the world. We are proposing to ask him—and he is a gentleman in receipt of an extremely large salary—if he will come over here and give us advice on what we should do in order to increase the fertility of our soils, especially of those used for sugar. We cannot read the accounts of the production of sugar in other countries without feeling ashamed that the Queensland sugar-grower is so far behind the rest of the world in sugar production. When we hear of the crops produced, say under Mr. Maxwell's expert direction in Honolulu, amounting to 10 and 11 tons of sugar per acre; when we read of Java's 6 tons and a little over, or an average for the whole island of 4 tons per acre; and remember that Queensland produces something like an average of 30 cwt. per acre—I think our sugar-growers may well feel ashamed of themselves. Of course land is dear in those places, and they have got to put brains into it in order to get a profitable return out of it. Land is cheaper here, but cheap land is coming to an end. There is a limit of distance over which it is payable to haul cane, and tramways are going out such

long distances after cane, past abandoned fields close to the mills, that it is high time, and indeed absolutely necessary, that a greater amount of sugar should be produced per acre than is being secured at the present time. (Applause.)

The Conference then adjourned for lunch.

SECOND SESSION.

MONDAY AFTERNOON, 2.15 P.M., 26TH JUN, 1899.

There was again a full attendance during the afternoon, and business was commenced by Mr. H. B. Black reading the following paper on behalf of Captain Henry:—

THE POSSIBILITIES AND DIFFICULTIES OF TROPICAL AGRICULTURE IN QUEENSLAND, AND HOW IT WILL BE AFFECTED BY FEDERATION.

How federation will affect the tropical agriculturist of Queensland is to us, perhaps, the most important question of the day. Of course no sane person can fail to perceive the many and great advantages of federation, provided always the interests of the several States are properly safeguarded. To Queensland the greatest boon that federation could bring would certainly be that of intercolonial freetrade, which would practically give Queensland sugar-growers a monopoly of the Australian market. But it were folly for us to shut our eyes to the fact that there is a very possible danger to the tropical agriculturist in the Constitution which will shortly be submitted to the electors of Queensland. I need scarcely say that I allude to the question of Polynesian and Papuan labour, and I cannot better place before you the position in which the colony will be with regard to this question, should the Bill be accepted, than by quoting from Sir Samuel Griffith's recent paper on the question of Federation. Sir Samuel Griffith says:—"One of these subjects, however, deserves special reference. I refer to No. XXVI., described in these words, 'The people of any race other than the aboriginal race in any State for whom it is deemed to make special laws.' These words would empower the Federal Parliament to deal with the coloured labour question in any of the States. In the Bill framed by the Convention of 1891, it was proposed that this power should be vested in the Federal Parliament exclusively; but in the Bill now under consideration, the Parliament of Queensland will, as will the Parliament of every other colony, so far as regards its own territory, retain power to deal with the subject until the Federal Parliament of the Commonwealth thinks fit to exercise its paramount authority. The present Bill therefore gives a freer hand to the several colonies than that of 1891. It was admitted in both Conventions that the question of alien immigration must be left, in the last resort, to the Federal Parliament, but the Convention of 1897-8 has left the matter to be dealt with by the several States until the Federal Parliament thinks fit to interfere. The probability of the Federal Legislature interfering with the existing laws of Queensland with regard to Polynesians, may be gauged by the fact that, up to the present time, the Legislature of New South Wales has never attempted to touch the subject, although it largely affects the northern areas of that colony." Any opinion expressed by Sir Samuel Griffith is worthy of very weighty consideration, yet I cannot but think that in this matter he is inclined to take a very great deal for granted. It must be borne in mind that the employment of kanakas in New South Wales is not a matter recognised, controlled, or restricted by the State; their presence in that colony is an accident; the question is one of those sleeping dogs that may at any moment be aroused; and, indeed, the education test, which has recently been imposed in New South Wales, already effectually bars their further introduction. The average Australian neither knows nor appreciates the fact that the 7,000 or 8,000 kanakas in our midst give directly or indirectly employment to some 20,000 or 30,000 whites, who, but for them, would have to seek a livelihood elsewhere. If we cannot be sure of our own people—and we know too well that, in the heart of the sugar-producing districts, many who live solely by the sugar industry are prepared to let it perish, so long as the kanaka goes with it—can we expect the democrats of New South Wales and Victoria, who have no knowledge of our climatic conditions, to be more forbearing? It must not be forgotten that the question as to whether an European race can perpetuate itself in the tropics has yet to be solved. We are still in the first generation, and we cannot ignore the fact that very few natives of North Queensland are to be found in the ranks of the agricultural labourers; neither have we any right to expect that there will be a continuous overflow of white labour from colonies in which the conditions of field work are so much more healthy and pleasant.

For my own part, I would be very sorry to see white men trashing and cutting cane in North Queensland. I greatly prefer to regard it as the future paradise of the industrial and frugal working man of the South, who, with their three or four years' wages saved up, shall cover the North with small farms on which the black man will perform the labour which is unfit for the white. That the influx of alien coloured races which might compete with us in all the walks of life should be forbidden, and that kanakas should be kept solely at tropical and semi-tropical field work, I claim to be very right; but I maintain that it is the duty of every Queenslander to see that the great industry—the only possible industry—of the Northern coastal districts shall not be lightly jeopardised. Just now people are a little hysterical over federation and ready-made Constitutions, and it would be well if they were to pause and reflect that federation may be too dearly purchased. I beg to move that: "In the opinion of this Conference federation will seriously imperil the continuance of tropical and semi-tropical agriculture in Queensland unless there is some guarantee that no obstacle shall, for the next twenty years, be placed in the way of the importation of Polynesians or Papuans for tropical and semi-tropical field work."

At the conclusion of the paper, Mr. CHATAWAY said: With regard to the motion at the conclusion of Captain Henry's paper, I understand that, with the consent of the writer, it has been withdrawn, and stands so accordingly. There was a widely expressed wish this morning that the discussion first of all on Mr. Denman's paper, and then on papers of cognate subjects, should stand over. I now find that on Thursday we shall have time to discuss the particular question that is really raised in all these papers—namely, the question of labour. It is desirable that those who wish to discuss these papers should see them in print, and I propose now to meet their views, so that sugar shall not run on and get into every day, by postponing the discussion on these three papers till Thursday, the 29th June. For this afternoon I propose two things. Two matters have been mentioned to me as worthy of discussion, one of which I omitted to refer to in my address this morning. This is coffee. It was pretty fully dealt with at the Rockhampton Conference, and since that time a large area has been brought under coffee in Queensland. In fact, it appears to be an industry that is coming to the front with considerable rapidity. Since the Conference last year, a gentleman has been brought from India by the Department, and appointed as an instructor in coffee-growing. The other subject which we might discuss is tobacco. This is a very valuable product, and one that yields a large amount per acre. We have in the room, Mr. Nevill, the instructor in tobacco, and no doubt we have also in the room many farmers who have made tentative plantings of this weed, and who will be anxious, perhaps, to state their difficulties, or their reasons why they fail to get such returns as might be expected. I ask anybody who is anxious to speak on tobacco to address the meeting.

TOBACCO.

Mr. T. MACKAY (Cairns) said: All I have to say, Mr. Chairman, is gained from practical experience, and, I may add, that that experience has been only gained in the district from which I come. I have read no books on the subject of tobacco. What I have to say may not be applicable to the whole colony, but perhaps it will with a little variation. In the first place, people in Cairns, eight or ten years ago, in trying to make a living from the land, tried several things, and they were compelled to do this especially as there were no mills where they could have their sugar-cane crushed, as they now have to a certain extent. Amongst the crops tried was tobacco, and with a considerable amount of success. The great drawback, however, was, that when they grew the crop they were entirely in the hands of the manufacturer, who practically gave what he liked for the leaf, and eventually, on that account, the growers were starved out. When we entered upon tobacco cultivation, we were led to believe we could get from 10 to 15 cwt. per acre; but when we came to grow it the most we could get was from 4 to 5 cwt. per acre, and when we got a small price for that it practically shut us up. The reason of the small return per acre was the fact that the climate would only grow fine leaf, even though the land might be rich. When we sent our crop down to Brisbane, and the manufacturer gave us the smallest price possible, we knocked off growing it. Now,

however, there is a great change in agricultural methods in the colony, brought about principally, I may say, through the exertions of the Agricultural Department. Some years ago we were left to jog along as best we could for ourselves, but now, as you are aware, things are going better, and instead of importing everything we require, we are sending away a lot of produce, thereby improving the prosperity of the colony. Now we have had the Tobacco Expert lately at Cairns, with the object of inducing people to start tobacco again. When there, he told us he had been informed by a Brisbane tobacco manufacturer that he used to get good leaf from Cairns. The first thing in successful tobacco culture is a good, deep, well-drained soil. Red soil upland or alluvial flats are also good. For the Cairns district, the proper time for planting is March, so as to have the plants ready to put out by the wet season, and thus enable them to get a good start. If they thus get a hold in the ground, they can carry on without rain. The crop grows in the winter in the Cairns district, which is impossible in the South. It ripens in the winter, and when the summer comes your shed must be ready. The plant grows during May, June, and July, and after that the next process is the cutting of the crop and housing it in the shed. The drying is done in July and August when there is scarcely any rain, and when the climate is all that could be desired for the object in view. This shows that the whole work of growing the leaf and preparing it for market does not occupy a very large part of the year, and I believe, even with only a yield of 4 or 5 cwt. to the acre, it would pay if a fair price were secured for the leaf. At 1s. per lb. such a yield would return from £20 to £25 per acre, and consequently I think, for a small farmer, tobacco is an eminently suitable crop. The labour for it is required in the off season, and could be performed by the women and children. The federation of the Australian colonies would open up a big market for our Northern products; tobacco of the finer quality among others. There is no doubt there would be a market in the other colonies for that leaf, and with federation I feel sure that tobacco, if grown, would be a paying crop, and one eminently suitable for close settlement on the soil.

Mr. R. S. NEVILL (Tobacco Expert): I would have preferred, before being called on to speak at this stage of the discussion, that the gentlemen present had expressed their views and opinions, thus giving me some idea of what they want to know. In other words, it would have pleased me better to have had all the evidence before I presented my case. I know that in these colonies, as in every country where tobacco has not been a staple product, it is not clearly understood that there are several different varieties of tobacco which are used for special purposes, that these tobaccos grow under different conditions, and that the treatment necessary for them varies considerably. For instance, you may take the Texas leaf here. Texas cannot produce a cigar tobacco, but it can produce a very good pipe leaf, and to the extent of from 8 cwt. to three-quarters of a ton per acre. Of course, as our Chairman said this morning, our methods are as yet to some extent crude, and the processes are especially so. But I think there can be no sort of question—that is, so far as Texas and Inglewood are concerned, as well as the surrounding districts—that Queensland tobacco can be improved so as to drive out of the market foreign tobacco of the heavier pipe varieties. Now, there is another thing about growing tobacco, and that is, that the plant adapts itself to soil and climatic conditions more readily probably than any other crop. It is not an unfrequent thing to grow excellent tobacco at a certain place, and yet twenty-five miles away, with the same seed, and apparently on similar soil, the crop is a failure. Mr. Whitney, in his report to the Agricultural Department of the United States of America on the tobacco soils of the United States, after a very exhaustive report, winds up by saying that, after all, we can only determine whether or not a given district is suitable for tobacco by actual trial, for the reason that both the product and the plant are so susceptible to atmospheric and climatic conditions, that we cannot determine, even with the most delicate instruments, except by actually growing tobacco, whether or not the plant is suitable to that particular locality. Now, it is on this account that so many people who have been engaged in growing

tobacco, and who have not met with the success that perhaps their efforts deserved, have attributed their failure to prejudice against the article they produced. They have obtained seed from a given country, but have failed to produce a satisfactory article, an article possessing aroma and other necessary qualifications, and they are consequently disappointed. Now, I never commit myself as to whether a given district will grow a good tobacco or a bad one until I have seen or have information concerning the product of that given district. In North Queensland, of course, we must grow a cigar tobacco. You cannot grow a heavy type of leaf in a warm climate. When I first came to Queensland, the manager of the Virginia Tobacco Works in Brisbane wrote me a personal letter on the subject of tobacco from North Queensland, and he told me he was particularly anxious to have the industry there revived, for the reason that, formerly, a most excellent cigar tobacco had been produced there; that through his agents in Sydney he had forwarded to Antwerp, the headquarters of the cigar tobacco trade, a sample of Cairns tobacco, and that the Antwerp firm to whom the tobacco had been sent immediately wrote to their agents in Sydney, speaking very highly of this tobacco. This firm, too, offered to purchase tobacco of this type, but there was none to sell, owing to its cultivation having been discontinued in Cairns. Lately I had a communication from Mr. Heinecke anent the same subject, and I took the liberty of saying to him that he and the other tobacco manufacturers were at fault for this dropping of the industry. I told them that it was doubtless largely owing to their not having offered the farmers a price that would repay them for their labour that the local production of cigar leaf had fallen off, and now the article had to be imported from Manila and elsewhere. I think they see this, but whether they do or not is a matter of indifference to us. There are other markets besides Brisbane for cigar tobacco. Cigar tobacco in London is worth from 1s. up to 10s. per lb., and from 3s. to 4s. per lb. is not an unusual price. In the State of Florida, in the United States of America, where they have been growing tobacco since the Cuban revolution, and where the industry has had quite an impetus given to it, they have even thought the crop so valuable that they have been actually houghing in their fields, with the result that the return has been as much as £200 per acre. They there cut two crops every year, including the ratoon crop. Mr. Mackay is quite right when he states that the return from cigar tobacco is from 4 to 5 cwt. per acre, but in these Northern districts, where there is no frost, you will be able to take off two crops, and then you should reach an annual return in leaf of from 900 to 1,000 lb., which, at from 1s. to 15d. per lb., should make tobacco a profitable crop to the grower. We all know that the world has no more cigar tobacco than it wants. Pipe tobacco is more plentiful, and yet it has been found to be in Queensland a most profitable crop. I feel sure that if the farmers in the Cairns district, when they were formerly growing tobacco, had only known how to manipulate it they could have exported it, and they would have had to-day one of the best industries that they possibly have entered upon. These are just outlines of the industry that I have given. But to give you an idea of some of the enormous profits that have accrued to others, I shall mention a few facts. I have not the figures before me, but they are at home, and if anyone desires further particulars I shall be glad to send them to him. Something like twenty-five years ago, the Sumatra Tobacco Company was started with a capital of £24,000. Since then no cash capital has been added to it. In 1893 they paid a dividend of 100 per cent., and the average of dividends since 1890 has been over 75 per cent. Their capital in 1894 was £321,000, with a reserve fund of £400,000. This same company that has done this business, and which has realised these enormous profits, so far as I can learn, is the same Amsterdam firm which is sending an agent to the Cairns district to see whether it is not suitable for tobacco. This agent is to be out here about next January, and this shows that there are some men who think there is a possibility of tobacco-growing being a success in Northern Queensland.

Mr. DENMAN asked what labour was used in Sumatra?

Mr. NEVILL: I know nothing about the labour in Sumatra, but in the States we employ white labour. There at least 75 per cent. of the men engaged in the cultivation of tobacco are white. One man in Florida last year, who employs white labour only, received £240 per acre from his tobacco. He got three crops, and sold it at 6s. per lb.

Mr. DENMAN: There is a gentleman in the room who tells me that he finds it impossible to grow tobacco here owing to mildew.

Mr. NEVILL: In the States we have no trouble with blue mould, but there has been a good deal of experimenting done in the colonies with the same disease. Blue mould usually attacks the beds, but if the modern practice of making the beds is employed, the danger of blue mould is reduced to a minimum. That is, the ground in the beds should be burned until it is well cooked, as it were, after which a small frame forming a box is placed round it and covered with cheesecloth, thus preventing the beds from being exposed to the night air or fogs. Where the beds are liable to be attacked by blue mould, the disease can be destroyed by the application of Bordeaux mixture in the form of a spray.

Mr. C. ATTHOW (Brisbane): The tobacco industry is certainly a promising one, but I think Mr. Mackay was somewhat wrong in blaming the manufacturers for killing it some years ago, so far as the North is concerned. If you cast your minds back you will know that at one time there was very little tobacco produced in the colony, hence arrangements had been made all over the world to supply Queensland with tobacco. Then some having been produced and having fetched a good price, everybody rushed into the industry. If they could have produced a tobacco similar to that imported or similar to that which suited the tastes of the consumer, the American tobacco would have been driven from the market, and the industry would have been a great success. But you all know that in a new country the flavour and aroma of the leaf is not likely to be similar to that to which the people have been used. Consequently they refused to take the colonial tobacco, and although owing to the duty it could be sold at a much lower price, it found no purchasers. The idea that the manufacturers ruined the industry is quite erroneous. As a matter of fact they could not place on the market what they made. In time, the tobacco being cheaper, people began to use it. Men with experience in its manufacture came from America and catered to the tastes of the people, so that now, I believe, colonial tobacco is used to a large extent, and will be used to a greater extent still in Queensland. As an instance of the necessity of attending to the tastes and requirements of the market, I may mention the case of a gentleman who had a large orchard of Seville oranges a few years ago. He could not get a purchaser for any of the fruit, so he cut the trees down. Now there is a good demand for Seville oranges. In that case the manufacturers did not know the industry, and they did not want the oranges. So with the Cairns cigar tobacco. Seven or eight years ago cigars were not manufactured in the colony, but now they are made here, and I do not think there is any possibility of there being a glut in the local market for this class of leaf.

Mr. P. McLEAN: There are two matters in connection with this industry that militated against the success of colonial tobacco. The earlier growers not only grew the tobacco, but manufactured it themselves also. As this latter business was one of which they had no knowledge whatever, when this home-made article was placed upon the market one trial was quite sufficient for consumers. The second matter was the want of knowledge on the part of our growers in the preparation of the leaf for the market. The Agricultural Department took a good deal of interest in this subject, and some years ago several samples of leaf were procured from growers and forwarded to England for expert opinion. The answer generally was that the tobacco had not been properly prepared for export. At that time there was a tobacco expert, as now, in connection with the Department, and the question of proper preparation of the leaf was pressed upon the people, with the result that local manufacturers have since then been able to use up a considerable quantity of local leaf by mixing it with the American. In fact, at the present many are beginning to consider the Queensland leaf is spoiled by the admixture of the American.

Mr. GIDEON POTT (Proserpine): It is a well-known fact that colonial tobacco up to date has been of a very inferior quality, and even an aboriginal will tell you that. When he purchases tobacco he always asks for Derby, which is a pretty good proof of the quality of the colonial leaf. I would be glad to know whether this inferiority is due to the leaf or to the manufacture.

Mr. R. S. NEVILL: The tobacco that is grown in the Texas district is certainly of very fair quality, but all colonial tobacco does not come from Texas. They are not growing it now in these unsuitable districts, but manufacturers have still stocks on hand of leaf from these latter places, and occasionally use them. The article, however, that is manufactured from the pure Texas leaf is a very good smoking tobacco. I smoke it myself, and I know of several other gentlemen who do. There are plenty of others also who would use it if they were not afraid of their friends smelling their smoke and of thus losing their reputation for smoking good tobacco. I do not claim to be an authority on tobacco manufacture, but I confess there are some features of the processes here that I would alter if I attempted the business. For instance, they use sugar here. We do use sugar in the States sometimes as a disinfectant, but not on smoking tobacco. Neither in Great Britain nor in the United States, however, is sugar used for the same purpose as here in the manufacture of smoking tobacco. Aromatic gums are, on the contrary, used. Sugar imparts an unpleasant flavour to the tobacco, although, I understand, some people cultivate a taste for it and rather like it.

COFFEE.

Dr. THOMAS (Cairns), in introducing the subject, said: I have been desired by the Kuranda people to see that the coffee industry is discussed at this Conference, and considering its importance I shall, with your permission, gentlemen, make a few remarks on the subject. What has been said with regard to the quality of Queensland tobacco has also been said of Queensland coffee. When we first sent it to the South the reply was, "No price; and if you cannot grow better coffee you had better leave it alone." This, of course, threw a great damper on the industry, and for two or three years our growers knocked off planting. Still we had a few trees, and I had the good sense to send a sample to Europe. I got a very favourable report on it, and it is only six months ago since my coffee received a special prize at the Marseilles Exhibition. As Marseilles is one of the leading ports for coffee in the world, I think such recognition is good proof of the value of Queensland coffee. In the Cairns district there are at present 400 acres under coffee, where two years ago there were not 50 acres. I am pleased to say the Government has given us an expert, who is now amongst us and is teaching us what we should do. I am sorry Mr. Newport is not here, but he has other duties to perform—in fact, too many. Some people will say coffee requires a large capital, and that it is only a rich man who can go in for it. If that were so, it would preclude a large number of us from going in for it; but let me tell you that there is no such thing as the necessity for a large capital for coffee-growing. Mr. Newport thought the same thing. When he came to my place, he saw I had not taken away the stumps and logs, that I had planted rice between the coffee-trees, and he was rather astonished, my system being a new revelation to him. "What! Two crops on the one land! That will never do." But, I said, "Wait till I get my rice, and then I shall have a few pounds for working expenses." Finally he said I was doubtless right. Coffee can be grown very cheaply in Queensland. A crop of corn or rice between the plants will not hinder them in any way. In fact, in windy weather it serves to act as a break-wind, and in hot weather as a shade. It is actually beneficial besides being remunerative. You all know that in coffee countries shade trees are planted for the coffee trees. These bananas and acacias, the trees generally employed, mean extra labour, expense, and time. Instead, therefore, of trying these, I experimented with rice, and this year I reaped a very fair crop of paddy from 30 acres of coffee that I have planted, which has almost paid my expenses in

connection with the plantation, from the felling of the virgin scrub to the present day, besides providing shade for the young trees. This, I think, should be a sufficient rebuttal of the idea that only rich men should tackle coffee. It is a poor man's crop, and a crop that will make him wealthy and rich. Coffee is very simple in culture. You can take the seed and plant in April or May; in six weeks' time it comes out of the ground, when it behoves you to shade your coffee. About January or February the trees are strong enough to be transplanted, they being then about from 8 to 10 inches high. The proper time to transplant in North Queensland would be from the end of January to the end of May. I am transplanting some myself at the present time, but still the period I have mentioned is, I think, the best, and that is during the whole of the rainy season. Between from 7 to 9 feet is the best distance apart to plant the trees. If the ground is hilly or not level, or not too rich, I should not put them nearer than 7 feet 6 inches. But if the land is flat and rich I would advise a distance apart of from 9 to 10 feet. On a flat near the Barron River, four years ago, I planted coffee-trees 10 feet apart, and they are now touching one another, and if I had not stopped them growing they would have been 8 feet high. They are, as a matter of fact, 6 feet in height, that being the highest you can pick from. Three years after you have planted them you will have your first crop. The maiden crop will not yield more than 4 cwt. to the acre, supposing the trees are planted 8 feet apart. The next crop would be a fair one. Then you get between 6 and 7 cwt. to the acre. In the fourth year the crop reaches 10 cwt. I have 2 acres on a flat near the tidal waters of a river, from which I got over 12 cwt. per acre last year. There is very little labour connected with coffee. You need not till the soil so carefully as for, say, maize or rice. As long as you keep the weeds down the coffee-plant will never suffer. Neither the harrow nor plough is needed. After a year or two you can use the scythe, provided you hoe the ground 3 or 4 feet round the plants in a circle. When hoeing the weeds near the plant be careful not to cut the ground too deeply, say more than 1 inch or $1\frac{1}{2}$ inches, because the roots spread very close to the surface. With the exception of the tap root, they seldom go deeper than 6 inches, the bulk being within an inch or two of the top of the ground. Another good plan is to mulch the plants, and that is a reason why I grow rice among the coffee. I use the straw of the paddy after the grain has been taken off to mulch the trees, mulching all round where the land has been hoed. I do not remove the mulch at all, and during the rainy season it becomes rotten. To touch the ground then would be dangerous, so I simply stick a fresh mulch on to it. From this it will be seen that there is very little labour in connection with coffee, and I am happy to say there will never be any dispute as to what kind of labour we are to employ. As to the treatment of the plant I shall not speak, as we have now in the service of the Government a Coffee Expert, but there is very little trouble and expense in connection with it. The blossoming starts in August or September, and the blossoms fall off in November, or just after the beginning of the rainy season. The fruit ripens from the 1st of April to the 1st of August. It may be said that it must be very inconvenient to have the time of ripening extend over so long a period of time, but I consider it a blessing. The older the plant gets, the later will its crop ripen, and this is another wise provision of Nature. I find the first year's crop ripens in March and April, or just in the thick of the rainy season, when there is a difficulty in drying the berry. The same plants after a few more years will not ripen their fruit until June and July, the wet season being thus avoided. It may be here stated that in Brazil they are greatly hampered owing to the rainy season. There, it occurs just while the coffee is ripening, and to overcome the difficulty the coffee is dried by the aid of furnaces. In this particular case, at any rate, Queensland is the home of coffee. Weather cannot kill coffee, and I have had trees burned by bush fires which have recovered without any apparent ill-effects. Some time ago I put in 40,000 plants, and I do not believe that 200 of them died. As for picking, it is very easy work, and any child over seven or eight years of age can do it.

We shall use white labour for picking—namely, our own children. The picking, of course, has to be done by hand, but I would advise people not to be too rough in the operation, and break twigs, &c., as you thereby destroy secondary branches. A child under twelve can pick in a day 25 per cent. more coffee than a man. The average at the beginning of a season may be reckoned at 100 lb. per day, but it may go down to 70 lb., or as low as 50 lb., per diem. With regard to price, I have an offer from a continental firm for any quantity, be it 500 lb. or 50,000 lb., for my coffee, at 9d. per lb. Independently of this, I have an offer from a firm to take all the coffee grown in the Cairns district. This latter firm has not yet quoted a price, but has asked me to send a sample so that they can offer a price for the whole crop for a term of years. There is a sure market for coffee; it is an easy crop to grow, and one that is most remunerative. At least we can get £30 net per acre from it, and I think we can get as much as £40 or £45 per acre. Coffee is the crop for the poor man. It requires no mills, no tramways, nor anything of the sort. It requires a hoe, a pruning-knife, and a scythe to cut the grass. I have now to ask, on behalf of the Kuranda coffee-growers, that a drying-kiln be put up at the Kamerunga State Nursery, and I think it would be of great value to the district. It would not cost more than £70 or £80, and if erected near the railway station it would be a great convenience to coffee-growers. If such a kiln was erected by the Government it could be looked after by one man at very little expense. If put up privately, it would cost more and would probably be not nearly so effective. With regard to varieties to plant, I would not advise any grower to try the Liberian. It apparently has a big berry, but when you come to take away the parchment it is very small, and besides, it has no aroma. You cannot sell it. It is the Liberian coffee that is grown in Brazil, and my friends there gave me poor reports of it. I would strongly recommend you, therefore, to grow the Arabian coffee. Of course there is what is known as the Mocha coffee, but, as Mr. Newport will tell you, there is no such variety. Mocha coffee is grown at Mocha, and it owes its peculiar qualities to the sandy soil on which it is grown. It is very rich in aroma, but it yields a very small crop. I may here say: Never attempt to grow coffee on a subsoil of clay, but always have good subsoil drainage. A good subsoil of sand gravel makes a perfect coffee soil, and the richer the soil, the better for the coffee. As to hulling, once the cherry is ripe it must be pulped, and take care it does not get overripe. But I may say that if you do let it become over-ripe, let it remain on the trees until it falls to the ground, so long as there is no grass or moisture there, and if you go to the trouble of pulping it, you will have a better coffee than if you had pulped it when it was fresh. That is what happens to Mocha coffee. The natives there let the fruit dry on the trees and fall to the ground. They actually harvest it by sweeping, and if you buy Mocha coffee you will find it all mixed with sand. This makes the best coffee, but as far as we are concerned, the system is not practicable. Coffee should be exported in the parchment, for if the parchment is taken off, and the coffee come in contact with the sea air, the aroma is destroyed, with the result that the coffee becomes tasteless and valueless. The proper way to preserve coffee is in the parchment, and that is the way to export it to Europe. My yield of 12 cwt to the acre was in the parchment, and, as a matter of fact, I sell no coffee but in that form. A gentleman asks me if I am in favour of the proposed increase in the duty on imported coffee, and I say that, without going into reasons, I am. I believe in federation in the main, and if we get it we shall supply the whole of Australia with coffee. Still I do not depend upon the Australian market, but upon the markets of the world, for the simple reason that we are able to produce a superior class of coffee.

Mr. J. PARKE (Tinana): Coffee does very well with me, but it has also its drawbacks. I have gained prizes for my coffee at the Maryborough show on several occasions, and have sold some of it as high as 1s. 4d. per lb. But with hand labour for picking it would not pay, and I thought it better to sacrifice the coffee than to sacrifice the education of my children; so I now only keep a tree or two for my own use.

Mr. F. W. PEEK (Loganholme): When this matter was brought up at Rockhampton last year, Mr. Bromiley laid great stress upon the importance of cheap labour. Dr. Thomatis, however, denies that it requires any labour. It appears to be more a question of family than of labour. Mr. Parke said he thought it best to sacrifice his coffee than his children's education, and I asked Mr. Bromiley about the same matter last year. He denied, however, that the children's education was affected, and said that in his district the coffee was principally picked during the children's holidays. Of course that gave Mr. Bromiley the best end of the argument, but I can hardly follow Dr. Thomatis when he says coffee requires very little labour. I understand that coffee cannot be successfully cultivated, if labour is paid for, unless 10d. per lb. is received for the berry. Of course, if Dr. Thomatis has no labour to pay for, that reduces the cost of production, but still I think the labour question enters as much into coffee as into sugar.

Mr. E. DENMAN (Mackay): Many people think they will get children to do the work of picking coffee during the school holidays, but in South Australia this was tried in connection with the picking of olives, and failed. Before the emancipation of the slaves in the West Indies, most of the plantations there grew coffee and sugar. After emancipation, it became a question of labour—something had to go, and without exception they abandoned the coffee. In British Guiana to-day, the output of coffee is only a thousandth part of what it was before emancipation. Coffee required more labour than sugar, and it consequently had to go.

Mr. R. J. BLAKE (Blenheim): If Dr. Thomatis is able to make £30 per acre from his coffee, I am surprised at him asking the Government for a £70 drying-kiln. An industry of that kind, or any industry, if it once gets a start and is not able to carry itself on its own legs, ought, I think, to be let go.

Mr. B. O. BROOKES (Johnstone River): We have heard a very glowing account of coffee and of the profits to be derived from it, but very little about the drawbacks. I have heard that blight has appeared on the coffee-trees, and Dr. Thomatis forgot to tell us anything about that. According to him, it is all profit, and requires very little labour; but I want to know, is there any blight, or is there any other disease that will destroy the trees? We are told no cultivation is necessary, and in most cases where there is no cultivation, very little is got in return. Is there any disease likely to follow the want of cultivation?

Mr. S. E. TOOTH (Pialba): Mr. Bromiley, who last year gave the address on coffee at Rockhampton, does all his labour with his own family. His children do the picking, and he tells me they can do far more than an equal number of men, also that the picking comes on during the children's holidays. He is busy with his plantation at the present time, and that is the reason why he is not here at this meeting.

Mr. G. MUNTZ (Mosman): When I was in Cairns I had the pleasure of meeting Mr. Lewis, who is one of the most successful coffee-growers in Queensland. Mr. Lewis has just come back from Europe replete with the latest information about coffee, and he tells me the whole question is one of labour. I myself had grave thoughts of going into coffee. I had communicated with the Agricultural Department on the subject, and had got many particulars, but I was advised that it was largely a matter of labour. The reason why Mr. Lewis has been so successful is that he has had aborigines. They work for him, and it is by that means that he has made coffee so profitable. Aborigines are not available for everybody, and I was warned on no account to undertake coffee without seeing prospects of a good supply of labour. I would suggest that the matter is not yet fully developed, and that coffee has not yet reached the stage of an industry. It has not yet been shown what can be made from growing coffee, and my opinion is that everybody should go cautiously into it until its prospects are more definite.

Mr. P. McLEAN: The question of the profitableness or otherwise of coffee-growing depends largely in the quality of the article that is produced. I have samples of coffee in my office that brought in the English market 110s.,

112s. and 115s. per cwt. Coffee has been growing at the Kamerunga State Nursery, Cairns, almost since its establishment, and last year we sent to England 5 cwt. The coffee was submitted to experts, who pronounced favourably upon its quality, but, unfortunately, owing to there then being a slump in coffee on the English market, our Cairns coffee only brought 48s. per cwt. I was advised, however, that the same coffee, some time previously, would have fetched 75s. per cwt. in the English market. It is probably well known that the credit of first growing coffee on a commercial scale is due to the district in which we are now holding our Conference. Many years ago a gentleman here went in for coffee to the extent of some 10 or 11 acres, and I remember once when visiting him that his complaint was labour. I think certainly that the question of labour enters largely into coffee.

Dr. THOMAS: Of course labour is everything, but the question is whether the labour can or cannot be had, and I still maintain we can grow coffee without black labour. I said coffee is a poor man's crop, and I still say so. It is a family culture, and 5 or 10 acres can be attended to by a single family, if it is not too small. Five acres of coffee are sufficient to make a settler independent. It is an intense culture, and will give £30, nay, £40 to £60, per acre. We want settlers, plenty of them, and small farmers. My own experience is that coffee-picking will never exceed $\frac{1}{4}$ d. per lb., with either white or coloured labour. I can afford to import boys from the south—from Sydney—and keep a schoolmaster for them, and the picking will not cost more than $\frac{1}{4}$ d. per lb.

CANE GRUBS.

Mr. WM. BEALE (Childers), in initiating the discussion on the subject of how to eradicate the cane grub, said: Grubs visited us lately in large numbers and we were informed by the Department of Agriculture, which gave us some information on the matter, that the best way to get at the evil was to catch the parent of the grub—namely, the beetle. Now this beetle is very readily attracted by lamps; and if these lamps are placed in the middle of a tub of water, the pests are easily caught. In that way we reduce the beetles. In our district, we have felled something like 80,000 acres of scrub land within the last 10 or 12 years, and we are beginning now to get it under the plough. We find that by continual cultivation and disturbance of the soil the pest is also materially reduced, and its ravages are not so apparent now. The members of our association pay $\frac{1}{4}$ d. per ton on the cane sent to the mill for the purposes of beetle eradication, and on the money received we claim Government subsidy. Altogether, last year we spent between £300 and £400 on the collection of beetles, and, besides this, all grubs seen are picked up in the furrow when ploughing is going on. I find that exposure to the air kills the grubs, and the more the soil is disturbed the less trouble they ultimately give.

Mr. N. J. MIKKELSEN (Avondale): Although I have not had much trouble with it myself, the grub is certainly a very serious evil, and, as a remedy, more attention should be given to the assistance rendered by our native birds—say the ibis and the crow. I remember last year, when we were ploughing out cane, seeing ibis picking up the grubs. Of course I am living near the sea-coast, where there are any amount of such birds, but in other districts, where they are scarcer, steps should be taken for their protection.

Mr. W. GIBSON (Bingera): About 5 years ago we had a block of about 30 acres of land on which the cane was utterly destroyed. That cane we ploughed under, and during the operation two boys followed behind the plough picking up the grubs. Behind the boys again was a flock of about fifty ibis, which appeared regularly every day as soon as the plough started work, and these birds were particularly useful in picking up the smaller grubs which the boys missed seeing. That piece of land was ploughed in this way on three different occasions. Afterwards cane was planted on it, which is still there, and so far we have had no trouble with grubs in that particular block. About 3 years ago we had another field in which the grubs were picked out by the birds. The

field was replanted, but the grubs again appeared, and the land was again replanted. We gave it four ploughings, with boys behind the furrows picking up the grubs and placing them in tins. After three or four ploughings in this way, the land was once more replanted, and to-day there is a good crop of cane on it apparently unaffected by grubs. A month ago another portion of Bingera was destroyed by cane grubs. The land was ploughed out with a very small furrowed plough, with two boys behind picking up the grubs, and in four days these boys filled three tins full. This way of reducing the pest is, I think, as effective as capturing the beetle, and I consider it has been successful with us.

Mr. E. SWAYNE (Mackay): Unfortunately, in this district, we have had a very large experience of the beetle. It is some 25 years since they first appeared, and 7 or 8 years ago their numbers attained such dimensions as to threaten the stoppage of cane-growing altogether on the north side of the river. I think, however, that we have got them in hand. What we did was simply this: First of all, single plantations took the matter up, but it soon became apparent that concerted action was necessary. Some 4 years ago the Agricultural Department voted £1,500 to assist in the extermination of the pest. Immediately that was done, each locality in this district, where the grub was prevalent, started to collect money, although, of course, previous to this hundreds of pounds had been collected and expended in the destruction of the pest, but no official record was kept of the expenditure. Since united action was taken, however, we have kept particulars, and I shall now give you a few of them. Each locality formed a committee, and these appointed representatives to a central committee in Mackay. In 1896-97, the total sum passed through the central account was £1,323, the total amount of beetles destroyed being 17 tons. The Government endowment for that year was 17s. 1d. Next year the total amount passed through the central fund was £973 19s. 7d., and the quantity of beetles destroyed was 21½ tons. The Government endowment for that year was 14s. 9d. The reason for the increase in the quantity of grubs destroyed was owing to the fact that many localities which stood out the first year joined in the second. This present year we begin to mark the benefit, for, although as many centres are working as last year, yet we have reduced the cost of beetle destruction down to £353, the amount of beetles destroyed being some 11½ tons. The Government endowment was £1 for each £1 subscribed. At Nindaroo some years ago, after that estate had lost cane to the extent of thousands of tons, Mr. Paget started systematically to work, and in 1895, on that place, he collected 8,800 lb. of beetles. In 1896 the amount collected had fallen to 4,430 lb.; in 1897 to 1,599½ lb.; in 1898 to 1,186 lb.; and this year the amount so far gathered is only 867 lb. The locality at Nindaroo is expressly favourable to the grub pest, most of the land being surrounded by scrub; and if it can be coped with there, it can, I think, be coped with anywhere. As for funds, we levy in each centre so much per acre, although I understand in some centres the levy is made on the cane grown. At Homebush the levy is 6d. per acre, but last year no levy was made, as the credit balance from the previous year was sufficient to meet all expenses. The beetles generally come out about Christmas, but if the showers are earlier they come out earlier. Most of the centres paid 6d. per lb. for beetles collected. Of course the pest is kept down by ploughing the land, and if the birds follow the plough so much the better. With regard to cow pea, I suppose it is probable that any land which is rich in humus is suitable for the propagation of the pest; but I do not think cow pea is more favourable to its development than stable manure, for instance. The arguments against cow pea would also probably apply to it. Then there is the trash. We plough in the trash and have no grubs, although there are some people who think that doing this encourages them.

Mr. H. CATTERMULL (Woongarra): We have had fields very badly affected by grubs, but by exposing these latter to the sun we have got rid of them. In the Woongarra Scrub every farmer keeps a boy behind the plough, destroying the grubs, but as for catching the beetles I think it is impracticable. There is

too much forest land about, in which they find a home. You will find them there as thick as in the canefield; and I think the best way to rid the canefield of them is to pick them up.

Mr. A. C. WALKER (Isis) also made a valuable contribution to the discussion, he advocating both the catching of beetles and grubs. He also mentioned the peculiar fact that, although in his particular district there were practically no beetles last year, yet this year the ground was alive with them.

Mr. WM. THOMPSON (Childers): I would advise anyone when he sees grubs in a stool of cane to clear the whole lot out. The heat of the sun—that is, if it is pretty hot, say, about December—will kill the grub. My friend, Mr. Beale, tells me the grubs have not shown to any great extent this season, but I have seen them, and I think we ought to catch both grubs and beetles whenever we can. When we first started, we gave 1s. and then 6d. per lb., but that was rather much. Some men were able to make 10s. a night at it. It was afterwards lowered to 3d., and then the youngsters would not pick them any more. Last year, the grubs did not come out at all—that is, swarming, as they did in previous years; and it remains to be seen, in the coming summer, whether the beetles will come out or not. There are, as a matter of fact, a few in the ground. However, during the first season, we eradicated the beetles pretty well out of the place, and I think, if they appear again, we shall, with the amount of money that we have in the bank, try and get rid of them altogether.

Mr. E. DENMAN (Mackay): At Nindaroo there are certain trees and shrubs of which the beetles are very fond, and you can always tell them by the amount of dirt underneath. To get at the beetles the trees are shaken, but at Mackay there is not much night-catching done. The boys generally go out in the early morning or evening; and at 6d. per lb. they make very fair wages. The Nindaroo district is very infested, owing to the number of abandoned plantations in the neighbourhood, but still an immense reduction has been made in the ravages of the plague there. In places where a few years ago you would see acres and acres spoiled, you will now scarcely see a dead stool. With regard to trash, some time ago I was reading in an American paper that they were troubled with the same grub, and that a gentleman writing on the subject stated he found that where he had planted clover grubs had not troubled him. This gentleman stated that the dense covering of the clover on the ground killed the grubs, and I think the same would apply to cow peas. For myself, I have lost more by grubs eating out the eyes of young cane than by grubs destroying the large cane. Many growers are under the impression that the grubs do not do the whole of the damage to the cane, but that it is done by bandicoots in search of the grubs; in fact, in nearly all grubby stools you generally see the marks of rats or bandicoots.

Mr. J. C. BRÜNNICH (Agricultural Chemist): A gentleman has just asked me a question with regard to the efficacy of bi-sulphide of carbon in connection with cane grubs. My experiments with it at Homebush were quite successful, and I believe, if no other means were available, bi-sulphide of carbon would be quite successful for this purpose, and without being too expensive either. The advantage of using a remedy of this kind is that the crop itself is saved. If you got a good showery season after the application, it would be quite possible for the cane to recover, and the damage done by the grub would not be very serious. In fact, it has been said that rain kills the grub, but the truth is that the cane gets a fresh start, and the roots which had been eaten by the grubs start to grow again. Now, of course, if you waited for the grubs to ruin the cane, the application of bi-sulphide of carbon would simply kill them, and this could be done more cheaply by ploughing out the cane. If, on the other hand, at the beginning of the season, you notice the cane showing signs of failing, I am sure you could save your crop, at a cost of from £2 to £3 per acre, by using bi-sulphide of carbon, and at the same time kill every grub in the stools. A similar method is used in connection with the destruction of the grape-vine phylloxera, and in this case the bi-sulphide of carbon is much more difficult to

apply to vines than to sugar-cane, owing to the greater extent of the grape-vine roots, and a much larger quantity has to be used. In the case of the cane, on the other hand, you simply inject with a force pump a small quantity of the liquid about 6 inches below the stools, where the grubs are altogether, and you are quite sure of eradicating the lot of them.

Mr. G. MUNTZ (Mosman): With regard to the bandicoot, is it advisable to destroy or encourage it?

Mr. E. DENMAN (Mackay): I should destroy it.

Mr. G. POTT (Proserpine): In the Proserpine, bandicoots are very numerous and grubs very scarce. You find that where the grubs attack the cane; the bandicoots attack the grubs. I find also that the birds destroy an enormous quantity of grubs, and I think that in all farming communities the farmers should pay strict attention to the protection of the native birds. One of the reasons, probably, for the prevalence of grubs in this district is that when kanakas were allowed to carry firearms a few years ago most of the native birds in the district were destroyed.

The CHAIRMAN then invited Mr. W. T. Paget, of Nindaroo, Mackay, to contribute to the discussion.

Mr. W. T. PAGET: Before referring to our experience at Nindaroo, I must say that my opinion coincides with that of those gentlemen who have advocated the destruction of both the grub and beetle. At Nindaroo, in 1893, the grub began to assume very formidable proportions, and whenever we ploughed the land then we always collected the grubs, that being the only way we had of coping with the pest. In 1894 we had the assistance of the Agricultural Department, and thanks to the exertions of Mr. Chataway, Mr. H. Tryon, the Government Entomologist, visited the district, and personally I may say I am indebted to Mr. Tryon for teaching me how to tackle the grub. Mr. Tryon came here in August, 1894, and when we went out to the plantation he showed me the habits of the pest right through its various stages. He finally told me that we should probably find that the parent of this cane grub was the common great black cockchafer. I had seen these cockchafers, but certainly not in large numbers. However, we kept our eyes open, and after some rain in November we found the first flight of beetles. A campaign was organised, and I think it was at Nindaroo and Habana that we took the first steps, perhaps, in the colony towards the eradication of the pest. Personally, my brother and myself had suffered very considerably in the matter, and in 1894 we lost thousands of tons of cane. From what Mr. Tryon had told me, I thought it probable that the female, after emerging from the ground, would not lay her eggs within a fortnight, and that year we destroyed 4 tons of beetles, the campaign lasting from November until March. Mr. Tryon, who was in Mackay again in December, visited us, and, when he saw what we were doing, said it was probably the best thing we could do, and that he could not suggest anything better. Last year we only destroyed 800 lb. weight of beetles, so that in five years on one estate we reduced the cost of beetle destruction by nine-tenths, and have reduced the loss of cane from this cause by thousands of tons. This year I have not seen one stool of cane on the estate affected by grubs. In saying this, I am speaking to representatives from all parts of the colony, and I can assure you I am not looking at the matter with rose-coloured spectacles. If I had seen cane this year spoiled by grub ravages, I should say so, but I can honestly say that I have seen none. I think it goes without saying that where we can plough our lands, if the grub is bad, we, of course, have someone walking behind the plough picking up the grubs, and we naturally encourage all the birds we can to follow the ploughs. In fact, when the grubs were particularly bad, we had the birds so tame that, practically speaking, the ploughmen had to kick them out of the road when ploughing was going on. I need also hardly state that in attempting to cope with this pest every effort should be made to destroy both cockchafers and grubs. In 1896 we had the grubs so bad that in one 45-acre field we collected as much as 4 gallons of grubs in one 10-chain furrow. This year, in breaking up some 60 or 70 acres, we did not secure a pint of grubs; and with respect to

the idea that grubs affect scrub land more than forest, I may say that I am absolutely opposed to it. The grub originates in the blady grass country—*i.e.*, the forest country. If you break up a piece of virgin, blady, grass country, you will find the grubs very numerous; and the reason that they have been so bad with us on estates that are composed of a larger area of scrub than forest land is that the beetle is especially fond of certain trees that grow on scrub land. The female beetle will not travel very far; but the higher the tree she is on when she propagates her species, the further she can travel; and when we have fields surrounded by scrub badly affected by grubs, the reason is that beetles congregate on the scrub timber in preference to the forest. It is hardly necessary here to enumerate the timbers the beetle is most fond of; and in the second year, when I was engaged on this business, I had 18 miles of headlands, &c., thoroughly cleaned of what we called the beetle-bushes—that is, the timber which I had found the previous year the beetles to be the most partial to. It had, however, not the slightest effect. My opinion is that if you cannot give them, say, the parrot-bush, they will take to the fig-tree or forest ash or anything else they can get. I think, however, that with attention and combination we can keep the grub in hand. The initiation of the combining of the various bodies in the colony to get this pest under, arose from a Conference that was held in Mackay in 1896, at which there were delegates from the various parts of the colony, who came to discuss the matter, and the final result was that we managed to obtain from the Agricultural Department an endowment on voluntary subscriptions. I think I may claim, without any egotism, that the idea of voluntary subscriptions originated with myself, and I hope and trust to the great profit of the whole of the canegrowers of the colony. The reason I brought the matter forward was this:—In 1894 Paget Brothers spent some £400 in clearing the beetles from Nindaroo, and my firm was quite prepared to continue this if other people did their share of the same work. To the windward side of us there were large areas of land that had been under cane, but which had gone out of cultivation, and on these lands had grown very large quantities of timber of the kind particularly affected by beetles. Our canefields still suffered, and so, after getting rid of 4 tons of beetles in 1894, and seeing in 1895 thousands of tons of cane ruined after all our efforts, I concluded it would be advisable to get our neighbours to co-operate with us in reducing the pest. The result was that, towards the latter end of that year, I started the system of voluntary contributions from the farmers who supplied Nindaroo with cane for the purpose of destroying the grubs on the vacant lands. Then my firm subsidised the farmers' subscriptions £1 for £1. I then approached the adjoining landowners. They subscribed, and I am also happy to say the business people of Mackay, who are not canegrowers, also subscribed to the fund, with the result that in the beginning of 1896 we had £200 in cash to spend on these vacant lands adjoining the canefields. Of course this did not go very far, but still it helped. At the Conference I have already mentioned, I suggested that legislation be brought in to deal with the matter, but, although this idea fell through, the system of voluntary subscriptions was established, and on these we have received Government endowments ever since. I generally call a meeting of farmers about October or November to discuss the coming campaign. At Nindaroo, the farmers have always subscribed 1s. 6d. per acre, not on the acreage under cane, but on the area they are under agreement for. If a man is under agreement for 60 acres, and he has only 40 under cane, he pays on the 60—namely, £4 10s. At the Nindaroo centre, we have had to tackle the pest on an area of uncultivated lands extending for 8 miles north and south, east and west; and we have tackled it so successfully that in five years, in one set of canefields, we have reduced the destruction of cane from many thousands of tons of cane per annum to practically nothing, and we have reduced the catch of beetles from 8,000 lb. to 800 lb.

The Hon. J. V. CHATAWAY: In summing up this afternoon's work, I think we have had an instructive discussion on tobacco. On coffee we have learned a good deal, and it will encourage those who were somewhat in doubt as to the profitability of the industry to know that the very satisfactory price of 9d. per lb. has been offered to a Queensland grower for his crop over a series of years. This will doubtless encourage others to go in for the industry, and as the market is not inside the colony, but outside, they will probably do equally as well as Dr. Thomatis. Owing, perhaps, to the duty of 6d. per lb. on roasted coffee, there is very little coffee consumed in Queensland. The amount imported into the colony is something like 157,000 lb. in weight, or the produce of about 120 acres. The importations of coffee into this colony therefore are insignificant in comparison with the immense possibilities of an industry that can be so profitable and at the same time dispose of its produce in the open market of the world. An appeal was made for the erection of a coffee-drier in the Cairns district at a cost of from £60 to £70. I think that is scarcely fair, as the profits from 2 acres of coffee in one year should be sufficient to pay for such a drier. The eradication of the cane grub is a matter of the greatest interest to many farmers both in the Bundaberg, Isis, and some of the more Northern districts. It seems to me that those districts may yet enter upon the struggle which has already been gone through here. You will then find in those districts the advantages of having a strong farmers' association. It was the farmers' association of this district that first approached the Government with the view of getting aid to help those who were willing to try and avert this national calamity, which was imminent so far as the sugar industry was concerned. I think you will find, if the grub or cockchafer falls upon you with anything like the vigour that he fell upon this district, that mere isolated effort will be valueless. No mere picking up the cockchafer with a hen, or even a portable duckhouse, will stop this pest. Every effort will have to be made, and united effort alone will check a pest that preys in such multitudes.

The Conference then adjourned.

THIRD SESSION.

TUESDAY, 27TH JUNE, 1899, 9.30 A.M.

DISCUSSION ON GREEN MANURING.

Business was commenced by dealing with a question handed in by a delegate, asking if cow pea would grow on poor soil, such as would not produce crops without manure; and in connection therewith Mr. DEACON (Allora) stated that he desired to make an explanation. On the previous afternoon he had said cow pea was no good for grazing. He did not refer to fodder, as some of the delegates had appeared to think. It was understood in his district that stock would not eat it green.

Mr. McLEAN: Mr. A. A. Ramsay, of the Sugar Experiment Station, tells me that cow pea does do well on poor land. The finest crop of cow peas I have seen myself were grown at St. Helena, from the first seed we imported from America, on land that had been under cane for a number of years. There were several acres of them, about 3 feet high, as level as a table, and in such a solid mass that you could have walked right over the top of them.

Mr. E. DENMAN (Mackay): At the last Conference, Mr. Adams told us that cow pea would grow on very poor land.

In reply to a question, Mr. L. P. LANDSBERG (Rockhampton) stated that the cow pea he grew was the clay-coloured.

Mr. P. McLEAN: It would be just as well to warn delegates against the black eye cow pea. It is a very inferior grower, and altogether it is not a desirable pea for farmers to grow.

Mr. B. O. BROOKES (Johnstone River): I may say that I have never found that green manuring had the effect of producing grubs. We have had grubs all the time, whether we green manured or not. It appears to me, however, that

we have been confining our attention solely to cow peas. Yesterday I stated that we were growing chiefly the Mauritius bean, which is a heavier cropper than the cow pea, and, in fact, I have heard it said that you can grow 14 tons to the acre and plough that in. It is undoubtedly a fact that if a heavy crop of green manure is allowed to rot in the soil, it has the effect of pulverising and making it more easily workable.

Mr. J. C. BRÜNNICH (Agricultural Chemist): I have tried, in connection with green-manuring experiments in the Mackay district, rape, clovers, sunflower, mustard, &c. Undoubtedly for certain crops other green manures may be used; but where nitrogen is the object aimed at, leguminous crops are necessary. Green manuring represents a rotation of crops. The great disadvantage of the cane is that there is always the same crop on the land, and it is for this reason that green manuring is peculiarly beneficial in connection with cane farming. It was recommended here some time ago to use sorghum or maize as a green manure, and there is not the slightest doubt but that you get the most prolific crops therefrom. From a scientific point of view, however, it cannot be recommended, because maize and cane are so much akin, and it is therefore more advisable to use a crop like the cow pea. You will always find that the largest amount of nitrogen is present just when the pods begin to form, and you can say, when the green manure is in proper flower, that that is the time to plough it in. However, if you take off the crop completely, the ground will still be benefited by it, owing to the rotation of crops, and, furthermore, the mechanical improvement to the soil is very considerable. The cow pea is a very deep rooter, and there is not the slightest doubt that our soils require aeration. Deep cultivation is necessary, and the cow pea really does bring about deep cultivation. A gentleman asks if good manurial results would be secured if a crop of cow peas were taken off a piece of land for fodder purposes, and the succeeding crop that springs up ploughed in; and I must reply in the affirmative.

Mr. J. E. NOAKES: Is the Mauritius bean good for fodder?

Mr. B. O. BROOKES (Johnstone River): I can answer that to some extent. We have never used it for fodder purposes, as we have had no occasion so to do, but horses are very fond of it when it is green.

In reply to another question, Mr. CHATAWAY said that coffee is growing about Brisbane and bearing well, but commercially the industry was, of course, only in its infancy in Queensland.

Dr. THOMATIS (Cairns), in reply to a question, said: Rice can be threshed in the same way as wheat or any other grain. In Cairns we have a kind of portable box, across the top of which a sort of ladder is placed, against which the rice heads are knocked, and the paddy falls to the bottom of the box. You may think this a slow process, but if you keep at it all day long you can get a lot threshed. The advantage of it is that you can get the box shifted from place to place, and you are not compelled to remove the straw. Of course it can be threshed, as is done in Italy, by the machine. Another method that has been tried at Cairns is by spreading it out and beating it with the flail, but in my experience with the box method nothing is lost, the grain is kept clean, and the straw has not to be carried.

Mr. F. W. PEEK, of Loganholme, then read the following paper on—

OUR FARMING AND INDUSTRIAL ASSOCIATIONS, SOCIALLY AND ECONOMICALLY CONSIDERED.

Since the first issue of the *Queensland Agricultural Journal* by the Department of Agriculture, which appeared in July, 1897 (and simultaneously with the inauguration of these conferences), several articles have appeared in its pages at various times pointing out and otherwise showing the great benefits to be derived by our farming community and producers in forming unions or associations—combining together to better their social position, and to assist in developing the resources of the district represented by such organisation in a more perfect and systematic manner; and it is also pleasing to note the steady increase of such institutions in this colony, judging by the lists published in the early numbers of the *Agricultural Journal* and in the present month's issue.

It is most gratifying to those taking an interest in such organisations, as showing the farmers and producers are at least awakening to the fact that "union is strength." Not only is this seen by the new associations that have started, but also in connection with societies that are developing their usefulness by creating branches in various parts of the districts, and by each branch sending delegates that are chosen by themselves to make up a representative council or committee of management to guide its affairs and to bring before the members' notice anything of sufficient importance for action to be taken that will be of benefit to the association or to the district generally.

The formation of such organisations tends to show that the spirit of unionism (or, perhaps, a better word would be "co-operation") is beginning to make itself felt and known to the men on the soil, who are combining together for mutual help and assistance; and now is the time when I would urge on those who have the master minds in the control and deliberations of our agricultural societies and associations to rise to the occasion, and not be content to look on whilst others are devoting time and energy to the organising of our farmers and producers. For if we are brought into closer competition with the southern markets, as we undoubtedly shall be with federation, it is our duty to give the most serious attention to the better development of the resources of our farming districts, and of our agricultural community, by forming and extending our association work—combining one district with the other for better systems of producing, marketing, and distributing; also for buying and selling, and in many ways assisting each other with friendly advice and help. Do not let it be heard said, "I would join your association only Mr. So-and-so is mixed up in it." Take a broader view, no matter who is in it. Let each farmer determine to be one, to work socially with another, and agree to organise and have his say as to what their future shall be, and thus help to minimise the many little troubles and complaints now heard of as to bad systems of marketing and distribution of our products by thus co-operating and working together. So much has been written on this subject that it is almost superfluous to attempt to emphasise in any manner the importance that it means to the advancement of the social conditions of our producers. At the monthly meetings of the association I have the honour to represent at this Conference, papers are brought up for discussion on subjects that are of interest to members; specimens of plants, &c., perhaps of new or improved variety, are displayed; market rates of produce are laid on the table for the information of members; the qualities of seeds discussed, and the prices; also various other matters—such as diseases in plants or fruits that are making an appearance in the district, and which call for serious consideration, specimens being obtained and promptly forwarded to the Agricultural Department, or a request is made for an officer (dealing with the particular subject under consideration) to pay a visit and inspect, which, I can add, is both promptly and efficiently done, to the satisfaction of members, the observations and instructions given being passed round among members, thus educating our farmers in a most practical manner in the various matters that are of great value to them in developing our resources, and attaining such results by combining together that single or individual effort could never achieve.

Whilst dealing with the social side of our agricultural societies and associations, I would like to draw the attention of this Conference to the last annual report of the Department of Agriculture for the year ending 1889-98, in which the Under Secretary for Agriculture draws attention to the annual shows or gatherings that are got up by some societies as one of their principal functions for which they are so formed or organised; and in referring to their methods and objects, he (the Under Secretary) points out very plainly the apparent degeneracy of such shows by the inclusion in their programmes of events, "side shows," and displays that are anything but "elevating" in their tendencies. Going further, he refers to special prizes being awarded for the worst specimens displayed in certain classes. Surely a statement like this, coming from such a reliable source, must be worth the attention of this Conference, especially when it is remembered that some societies and associations are receiving Departmental assistance, or a subsidy of 10s. in the £1 up to £125. I must say that I am not adverse to holding agricultural shows or annual gatherings in our "town and country" districts, which, if rightly conducted, may be productive of a vast amount of good by educating and showing the progress the district is making, and causing a healthy and friendly rivalry among its members, by the inclusion in its programme of such events as ploughing, matches, wood-chopping contests, comparisons of products, and the getting up of products in a better and more marketable form by grading, labelling, and classifying, &c.; displays of machinery of the latest "up-to-date" style and invention. All these objects are well worthy of being taken up, as they help to educate the producers and to stimulate a better class of product, besides being an enjoyable adjunct to the displays of produce, fruit, and flowers on exhibition, and thus giving an annual day's pleasure that is looked forward to and thoroughly enjoyed by old and young.

But, on the other hand, societies that are formed principally of townspeople, whose main aim and objects are the holding of an annual show, got up more for the benefit of townspeople where they are held, by providing races and sports and (as pointed out in the report referred to) usurping the province of the turf club, confer small benefit, and are only secondary in importance to those of a more up-to-date nature, whose objects are the development of their respective districts, the securing of better markets, and a better class of produce. Such societies and associations are to be commended, their shows being an object lesson of progress that is worthy the consideration of the Agricultural Department in the matter of subsidy or monetary assistance.

I have endeavoured to show that by organising our farmers into social communities or societies there is every reasonable prospect of creating a better feeling between them, and a friendly meeting together, doing away with the feeling of isolation, which the mode of life and conditions of our farmers practically forced upon them. I will endeavour now to show how the useful work of associations can be made, and is being made, in various parts of the world, a mighty factor in the increased prosperity of the agricultural classes. I will endeavour to show that, by the members of our associations extending their influence and work by taking up the economical side of our producers' welfare, as well as the social side, they will be the means of elevating the position of our existing societies, by creating institutions that will be of a lasting benefit in our various centres. By co-operating together for extending association work for buying, selling, and disposing of our products, the greatest amount of direct benefit is to be obtained. Our farmers must not be content with simply producing—they must combine for a better means of distribution; and I am pleased to have to state that many of the societies are taking into earnest consideration the best ways and means of finding markets for the disposal of their members' products, and for purchasing supplies not produced by themselves. These include implements, seeds, and the necessities of life which ends can best be obtained by the farmers placing their capital in a bank for that purpose. And here it is that by adding their capital together, and by combining their orders for their requirements, they are enabled to deal more successfully and economically for their wants at a minimum cost of trouble and expense to themselves. How to attain this end is the question of the day. Capital is required to enable those placed in charge of the management to carry out the schemes and desires of the co-operative body. It may be that a loan is required, or means for procuring farm implements, seed, &c., but capital must be found in the first place. And here I may state that I have no sympathy with the cry of "State aid" in the matter of providing cheap money. It is a well-known fact that State aid, or Government assistance financially, often does more harm than good by the assistance given. Funds so derived are often spent lavishly, and in a manner that no private individual would ever think of. They are spent without that keenness and careful supervision that an individual who was personally interested would exercise. The systems I favour are the co-operative systems of England and of the continent of Europe, where the people's co-operative banks for trading, raising and granting loans, and for other purposes, are so successfully carried out. Every little centre there has its own deposit bank, its own stores to supply the requirements of its members. In nearly every case the bank is entirely managed by its members, the directors being honorary, and the management being carried out as economically as possible. Such institutions have been the means of assistance to thousands of farmers and others by the help of loans at low rates of interest which they would have been unable to obtain otherwise. In starting agricultural co-operative banks for trading and other purposes, including loans to farmers, I would favour the joint stock principle, limiting the number of shares to each individual with a limited liability to the extent of the number of shares taken up, the directors being elected by the farmers from amongst themselves; all officers except the manager being honorary. The shares could be paid up by easy monthly instalments until the amount of each share value was fully paid; every provision being made for the protection of its members. The objects of such agricultural bank being for specified purposes, chiefly, as I have said, to assist its members by loans at a low rate of interest for the following purposes:—First, for making improvements on farm holdings; second, for the purchase of seed, implements, machinery, &c.; third, for loans to a district or to a branch of the association, whose members are interested in a specified product requiring aid for constructing and erecting expensive works, such as drainage and irrigation works, butter or bacon factories, flour or rice mills, jam factories or creameries, &c.

The directors also would have the power to buy, sell, and dispose of all products for the members of the association, and return all profits, less reasonable expenses incurred, to the members and shareholders. Low rates of interest could be fixed for borrowers (not exceeding 5 per cent.), and interest charged only on the amount that

would be actually withdrawn or advanced. All loans to be for a fixed period, and the interest paid half-yearly or at other stated times. The only "State aid" or supervision required would be the annual audit and inspection. I feel sure that once the benefits of People's Co-operative Banks come to be known, and form a part of the work of our established associations for the benefit of the agricultural industry we are representing to-day at this Conference, so soon will a new and prosperous future be opened to the "men on the soil."

The management of such associations is of necessity the most important. It has been argued that our farmers are not educated in business matters; that there will be divided counsels; that the requisite confidence will not be placed in their respective secretaries or managers sufficient to make success a certainty, and that therefore it will be impossible to compete with the individual capitalist. Such objections appear to be theoretically unanswerable, but they will be completely refuted by the examples of success which can be found in the countries of the old world, and even in Australia, where such associations are now formed on sound lines, without undue influence of one shareholder over the other, and where only the greater amount of business transacted may give more in financial returns to one member than to another. If such institutions were started in connection with our societies, where the credit of a member is endorsed by two or three other members, who guarantee that the loan so applied for is to be put to such uses, it must have a most beneficent and marked effect in the progress and development of our agricultural resources.

The first co-operative body established in the old country commenced operations at Rochdale. This was followed immediately afterwards, by the town of Leeds starting a co-operative flour-mill, in the year 1849-50; and although these two societies had in 15 years from the start done business to the extent of more than £1,000,000, they had not to set off £10 for bad debts. The societies of Italy are a marvellous example of what can be done by combined effort. In the year 1883, a few persons met in a back room in the city of Milan, whose joint capital only amounted to the modest sum of £28. (This was the exact sum that the Rochdale pioneers, by a strange coincidence, started with.) But the Co-operative Bank of Milan to-day has a share capital of £600,000; employs 100 clerks, 140 to 150 honorary officers; and an immense sum passes over its counters every year—all lent to the poor and industrious peasants of Italy to develop and create employment and wealth for themselves. In the Empire of Austria, the Government have passed a Bill (1896) making co-operation compulsory amongst farmers. So great is the benefit conferred by this legislation that in the year 1895 the official returns issued showed there were no less than 1,916 co-operative societies established, and in the same year no less than 994 credit banks. I can also refer to the agricultural people's banks of Ireland, which were started by the Irish Agricultural Organisation Society, which commenced operations at Doneraile, in County Cork, in the year 1895, having for its objects "to improve the condition of the agricultural population of Ireland" by teaching the principles and methods of co-operation as applied to farming and its allied industries, and which have been a great help and assistance to the poorer agricultural classes, who are enabled to borrow on personal credit or on the security of others from the village bank. The timely assistance given enabled "poor Pat" to do a great deal on his little farm or holding which he would otherwise not have been able to do. Coming nearer to our own doors, I could draw attention to the success of the Farmers' Co-operative Societies of New Zealand, Tasmania, South Australia, and New South Wales. For one illustration, I will refer to the Co-operative Wool and Produce Company of Sydney, whose commission charges are $3\frac{1}{2}$ per cent. on sales, and who, on their second season's sales from 33,066 bales of wool consigned to them, showed a net profit of £5,394 4s. 1d., or a saving of 3s. 6 $\frac{1}{2}$ d. per bale on the usual woolbroker's charges of 6 per cent. Surely then this question of extended association work, for its economic value, is worthy of every serious consideration and practical support. By co-operating together, if only for marketing purposes, the complaints that are now heard on every hand of the excessive rates and charges for the disposal of our products, and which are an unfair and burdensome tax, would be no longer heard. It is the charges that are now being made that have reduced the margin of profit to the producer to such an extent that the development of the agricultural industry is seriously retarded. But if our associations and societies will awake from the apathetic state into which some seem to have fallen; if they will decide to be more practical and keep abreast of the times; if they will start such institutions as are being advocated all over the world, by which the producer is to become a working partner in a thriving joint stock concern, the latter will be at once advanced into a different social grade. He will no longer be the hard over-worked, wet or dry, from daylight to dark producer, who toils on from year to year, without any cessation, to produce crops that have in some cases to assist in keeping four or five other individuals (before reaching

the consumer) on the results of his labour, and leaving in some instances a debit balance instead of a just reward. No; he knows that under the benign influences of association and co-operation with others fair values will be maintained, the markets will be regulated, and the better the product the better will be the price for his goods. He will also be assisting to build up an institution that cannot fail to succeed if properly safeguarded in its operations and management. I could enlarge on the benefits to be derived from affiliation of one association with the other, organised together for the various objects of common interest, particularly in the marketing and distributing of our products. Let me take, as an illustration, the farmers of the Logan, Lockyer, Laidley, and Gatton districts combining together to establish a market at South Brisbane, where already are to be found cold stores erected, each of these districts having railway communication already established right on to the market reserve, and where there are shipping facilities available, vessels of the largest size being able to lie right alongside the wharves. Now, I would suggest this to the favourable consideration of the districts I have named. By the establishment of such a market under joint control with the municipality, by the appointment of an auctioneer by the associations collectively to conduct all business and sales at a fixed salary, the result must be the breaking down of the rings of buyers and middlemen who are running the existing markets, and abusing the confidence of our producers, by the poor returns and the heavy charges made. Before closing this paper on our associations and their work, I may state that I have been particularly requested to tender the thanks of the Logan Farming and Industrial Association to the Department of Agriculture and its officers for the valuable information received through the medium of the *Agricultural Journal*. Its monthly issue is eagerly looked forward to, and its pages severely criticised, the matter circulated being the subject of frequent discussions, and its teachings experimented upon by our local producers. The results of its teachings must have a marked effect and place in the future development of the resources of our colony, as supplying a long-felt want.

In thus considering our social and economical position, as regard association work, I know I have indicated a slight departure from old-established ideas and forms. But we must move with the times. One would never think of using the appliances, implements, and methods which were employed in the days of our forefathers. So with our agricultural societies and associations. Old-fashioned methods and ideas of what was required by our early societies must be abandoned or else combined with methods of practical utility. Sociability and friendship in our meetings, and economic principles and innovations must be recognised and accepted. With true co-operation as the order of the day, and with our better systems of producing, distributing, and banking, our agriculturists and workers on the land will find the true solution of our economic problems and a realisation of the dream of "industrial peace."

Mr. PEEK then laid on the table the following draft of a Bill intended for existing societies or associations who are desirous of extending their usefulness. The Bill is entitled—

AN AGRICULTURAL BANK FOR LOANS, TRADING, AND OTHER PURPOSES.

1. It having become advisable, and for the benefit of members, to further increase the powers and usefulness of this association, it is agreed that a certain sum of money shall be subscribed by each member in forming such extension for the purposes of mutual help and assistance, as hereinafter set forth. Such funds to be applied to the use and benefit of members contributing to such bank or fund for co-operative purposes.

2. Membership shall be open to all persons over the age of 18 years.

3. *Capital*.—The capital shall be raised by shares, which shall be issued from time to time as required, shares to be of £1 each in value. No member to hold more than 20 shares.

4. Payment on account of shares can be made monthly at the usual meetings of the association till such time as such number of shares are fully paid up, the payments being at the rate of 2s. 6d. per share per month.

5. Shares may be transferred, but only to any other member of the association, who cannot hold at any time more than 20 shares in all.

6. Directors shall be appointed by the members of the association being shareholders, such members to have been clear on the roll-book for not less than 12 months. The number of directors shall be not less than 9 in number.

7. Directors shall be elected by ballot, each shareholder having one vote, each branch electing one director, and the balance being made up from the general body of shareholders.

8. A director shall be disqualified or removed from office if he is a party to any dealings or sales by which he uses his position to his own special benefit; if he ceases to hold shares; if he is absent from three consecutive meetings of the council of directors without leave; or if he is concerned in, or participates in, any contract with the association other than the ordinary business as a member and shareholder of the association.

9. At the annual meeting held in January of each year three directors shall retire, who shall be eligible for re-election, and any casual vacancy (occurring in the number of directors) shall be filled by referring the same to the council or branch of the association as may be, who shall elect any other qualified member to act as director, to sit and fulfil such office only till such time as the vacating director would have retained office had no vacancy occurred.

10. The services of directors to be honorary, but the ordinary council of the association may determine upon any grant or remuneration for services rendered to the association, and may vote any such amount as may be deemed by them necessary for such services.

11. Any officer or member guilty of misdemeanour shall be disqualified from all privileges of the association, the same to be by a majority vote of the council or association.

12. The expulsion of any member shall not be subject to any appeal to law, nor shall any member or branch be entitled to any refund or compensation for moneys paid or services rendered whilst in membership other than by the sale or transfer of any shares which he may hold to other members of the association.

13. The secretary or manager shall be nominated by the council, and shall be appointed by a majority vote of the shareholders. He shall have control of all business, keep all documents, books, &c., and act as general agent on behalf of the association. Payment for his services to be fixed by the council, and he shall be indemnified by the society against all losses and expenses incurred by him in and about the discharge of his duties, except such as happen by his own wilful act or default.

14. Provided that the directors shall not, without the sanction of the association's council, exercise any powers or incur any liabilities except those conferred and stated herein—i.e., only such as may be requisite for the due management and proper carrying out of any business acquired or undertaken by the association, and approved at their ordinary or special meetings.

15. The directors may, in their management of the business of the society, subject to the restrictions herein contained, commence (upon the registration of this association) to do business in the name and on behalf of the society, as follows:—

A.

The directors may buy, sell, and dispose of all or any farm and other products, in such manner as shall ensure the return to the members and shareholders of the full value of their products or requirements, less fair and reasonable expenses and charges incidental to the sale or disposal of the same.

B.

The directors may make arrangements for the grading of produce, shipping or importing, &c. (as the case may be), also for holding sales by auction, regulating markets, and for affording better means of distribution among members.

C.

The directors shall establish a system by which, after providing for all reasonable and incidental expenses, any surplus will be returned to the shareholders and suppliers of produce in the form of bonuses calculated on the quantity of produce supplied or on purchases made.

The directors may make loans and advances from the association funds on good security, the advances to be for members of the association only. Such loans to be divided into classes as follows:—

Class 1.—Advances can only be made for the purposes of making or effecting improvements, and no advance can be made on land which is otherwise encumbered, nor will any security over fee-simple lands other than a first mortgage be accepted as sufficient. When advances are required upon lands held under conditional purchase, the applicant will be required to execute an absolute transfer of all his right, title, and interest in such land, together with all improvements thereon, to the council of the association.

Class 2.—Advances may be made for the purchase of seeds, implements, machinery, &c., &c., all applications for loans in this class to be endorsed and recommended by not less than three members of the association, who shall be satisfied that the advances so desired will be used for such purposes.

Class 3.—Advances may be made to a district branch of the association (collectively) whose members are interested in a specified product, requiring the erection of machinery, such as rice or flour mills, butter or bacon factories, jam factories, creameries, &c. Also irrigation or drainage works, by which the whole of such district may receive a general benefit. Such loans or advances are not to exceed one-third of the total cost of the proposed work, and the application for such loan must be carried by a three-fourths majority vote of the members of such district branch.

Class 4.—Advances can be made from the association funds to assist the local bodies or others in the eradication of insect pests, noxious birds, and other animals, diseases in plants, &c., such advances to be made only by special vote of the association through the association council, who shall consider the application, and make such order relating thereto as the exigencies of the case shall appear to demand.

16. In cases where application for a loan is made, and where in the opinion of the directors ample security or credit is given for any of the before-mentioned works or advances as desired, such advances and loans may be made, in such proportion as may be desirable and at such times as the board of directors may appoint. All expenses for stamping and registering shall be paid by the borrowers. Valuations, drawing up of agreements, &c., shall be done free; but a charge of 1 per cent. will be charged upon application for a loan.

17. Interest at the rate of £5 per centum per annum or part thereof will be charged on all advances, and such interest shall be paid half-yearly. Interest will only be charged on the amount of loan actually obtained, or on advance made, or on such proportion of the loan as the applicant may have drawn.

18. All loans shall extend and have a currency for not more than 2 years, and shall be repaid with all interest due at that time. But an extension of time not exceeding one year may be granted by the directors should they consider the case of sufficient importance to warrant such extension.

19. The directors shall have power to defend, conduct, compromise, or bring any dispute to arbitration, and may abandon any legal proceedings or other claims by and against the association and the officers thereof, and deal with all other matters concerning the welfare of the association.

20. The directors may draw, accept, make, endorse, transfer, discount, guarantee, or negotiate such cheques, bills of exchange, promissory notes, deposit notes, and other obligations as may seem to them expedient for the purposes of the business of the association. Any such bill, promissory note, &c., shall be made, endorsed, or accepted by not less than three directors, and the seal or stamp of the association shall not be affixed to any instrument except by the authority of a resolution of the directors and in the presence of three directors who shall sign every instrument to which the seal is affixed in their presence.

21. The directors shall cause a minute to be kept of all appointments of officers, and a record of all directors present at meetings, also a record of all business transacted, all resolutions, minutes, votes, and proceedings, and shall produce such book at any reasonable time for the inspection of any shareholder being a member of the association.

22. The directors may declare a dividend to be paid to the shareholders in proportion to their shares. No dividend shall be payable except out of the profits arising from the business of the association.

23. The directors may deduct from any dividend coming due any moneys owing by a participating shareholder to the funds of the association. They may before recommending a dividend set aside out of the profits such a sum as they may deem necessary as a reserve fund to meet any unforeseen contingencies.

24. The directors shall at the end of each year prepare and lay upon the table a true statement of the business transacted during the year, showing all credits and liabilities.

25. The association shall appoint auditors, two or more in number, who shall be shareholders holding not less than ten shares each, and no person shall be eligible as an auditor who is personally interested in any transaction with the association other than as an ordinary member, and no director or other officer of the association or its branches shall be eligible to act as auditor during his continuance in office.

26. The directors shall have the power to pay out of the profits of the business a bonus to all consignors or persons trading with the association other than members or shareholders, in proportion to their trade and dealings.

On the conclusion of Mr. Peek's paper, the following was read—

AGRICULTURAL CREDIT; OR, CHEAP MONEY FOR FARMERS.

[By Dr. THOMAS, of Caravonica Park, Cairns.]

MR. CHAIRMAN and GENTLEMEN,—You will agree with me, I am sure, that the subject I have taken for my paper is highly important, and as it has been almost my lifelong study I have chosen it for this occasion before the representatives of the white agriculturists of whole Queensland. Electricity and magnetism are said to bind together the world—in fact, the whole creation; to wit, electric telegraphy and telephony—and being inherent with the matter, it transmits its action from molecule to molecule, from one pole to the other of the earth even without wires. Now, gentlemen, what electricity is to the material world, credit is to the human world or society. Credit has already proved itself to be not only the tie that binds society together, but also the quickening spirit or principle, so to say, that animates all actions of man. Credit has already been applied to almost all branches of business, and money or currency has been from the earliest ages till recently the visible, tangible, and outward sign of credit, be it in shells amongst the ancient Greeks and Egyptians, salt or tobacco by the Nubians, or cattle and sheep by the old Romans (hence the origin of our words *pecunia* and *pecuniary*), or at last be it gold and silver as in our present more advanced circulation. But recently even the latest improvement in the said outward sign in the shape of gold and silver coin has been again improved in the shape of bills of exchange, promissory notes, circular letters of credit, bank notes, and, latest of all, State Treasury notes. All this is sneeringly styled *paper money*, but should be, in my opinion, sublimely called *Human or Rational money*. The time will come, and very soon, when gold and silver will be completely abandoned as the outward sign of money and wealth, just as shells, salt, tobacco, and cattle have been abandoned. Silver is, in fact, already almost discarded, and with the spread of the economic science gold will also be given up as coin. The mercantile class has already bank notes; it is now time that also the agricultural class should have their agricultural notes. In fact, this was nearly done thirty years ago, and for the first time in Italy and France—the two countries from which the English people received knowledge of banks, bills of exchange, five or six centuries ago. Now, gentlemen, I shall briefly state how agricultural credit has originated and developed itself on the continent of Europe, for I am sorry to say it has not yet been introduced in Great Britain, although it would be one of the most effective measures to economically liberate Ireland, and also to relieve the present agricultural depression in England, as I had the honour to suggest to the late W. E. Gladstone twenty-five years ago. It is said necessity is the mother of all invention, so it has been in regard to the agricultural credit. In 1851, after the terrible political and financial strifes, which for a while paralysed the territorial resources, the farmers of France appealed to their new Emperor, Napoleon III., to assist them, which was done by the Government supplying them with sums of money on very easy terms under the name of “credit foncier,” which brought about wonderful benefits. Still it was as yet merely a State loan of money to be repaid, and such loan, as all loans, was subject to many conditions, and granted merely for that occasion. This, however, set economists athinking; and after the gigantic fights of the people of Italy and Germany to become free, independent, and united, their territorial reforms were greatly paralysed, and metallic money had become so scarce in these two countries, and indeed in France, and I may say in Austria also, owing to its exportation in order to purchase the materials of war, that I well remember a coin, not only of gold or silver, but even of copper, was a rare sight. The monetary crisis was so intense that not only merchants, but butchers, bakers, barbers, cabmen, and all sorts and conditions of men had to resort to print and issue currency notes of their own of the value of from £1 to 1s., and even 6d. ! The Government did not interfere, adopting the maxim of “*Laissez fuire, laissez passer !*”—or, “Do as you please,” simply because it was not then a necessity. Then landowners and farmers, in order to be able to carry on their daily transactions, I am glad to say, did the same. In less than a year not thousands but millions of these notes were issued and circulated, and got intermixed, and it was a common occurrence to see sixpenny notes issued from one corner of the State in the hands of people at the other extremity, and, wonderful to relate, they were accepted without comment, murmur, fear, or distrust. This, however, could not be called a satisfactory state of things, and so all the farmers of a district clubbed together, formed an agricultural circle or committee, which, on behalf and with the security of the farmers so leagued, issued district agricultural notes. Then larger circles were formed in each province, and finally one national association was organised for the whole nation, and at last, ten years ago, the

lines of the agricultural credit were so extended as to embrace the countries of Europe under the title of "General European Agricultural Credit." I may state that, once these circles and committees were duly constituted, the various Governments recognised the issue of their notes, which became legal tender. This, Mr. Chairman and gentlemen, was the crowning of the edifice of agricultural credit, the final triumph of such a beneficial principle of political and social economy. It was in 1870 that this principle was asserted at a general congress of agriculturists; and economists, bankers, and Crown Ministers were present. The humble reader of this paper, the son of a farmer, was then lecturing on political and industrial economy at a technical institute, and was chosen as delegate to the congress. Although I was then very young—in fact, the youngest of all the delegates—I fought hard and successfully for the principle, and with me also fought vigorously my colleague, the eminent economist of world-wide fame, Professor Ludgi Luzvati, who, I am delighted to say, was, four months ago, elected member of the Institute of France in place of the late Mr. Gladstone. So it is evident from this appointment that the civilised world and the body of scientists consider agriculture and agricultural credit as worthy of the highest consideration by so honouring their chief apostles. This has been more keenly appreciated in France, where the agricultural class is almost nine-tenths of the whole population, and there are over 37,000,000 freehold farms, and by whose Government, five years ago, a second order of knighthood was instituted, called the "Agricultural Merit," on a par with the "Legion of Honour." Now, gentlemen, if all this has been accomplished in Europe by the European farmers, why cannot the same be done in Australia by the Australian farmers? After visiting the principal parts of Europe to see how the system was progressing, I crossed the line 24 years ago, and came to Queensland with the only purpose in view to see the system also established in Australia. Twenty years ago I was advocating it in Victoria, where only lately it has been established, but on very narrow bases. In Queensland I have been advocating it ever since my arrival in 1875, together with central sugar-mills and central mineral-mills. The former we have at last, but in my opinion rather late and upon imperfect bases. Last year I forwarded to the Government a copy of the scheme formulated as a rough sketch of a Bill, a copy of which I have now in my hand to be laid on the table at the disposal of the members of this Conference, so that it may be read and recorded among the documents. It consists of thirty-six short clauses. Almost in a similar form I published it 16 years ago in the *Townsville Daily Bulletin*, and in a leading article it was stated that if it were adopted it would be more beneficial than Mellwraith's transcontinental railway. The scheme is on the same general basis as the European Agricultural Credit, but of course adapted to the special circumstances of land tenure in Queensland. Through it the farmer's labour is, so to say, capitalised or monetised, and it is made patent to the whole community, so as to be used by him to still improve his farm. The general value of the land is not considered, leaving it as a permanent asset of the farmer; hence the bases of the scheme are doubly guaranteed and secured, primarily on the improvements and crops or the farmer's labour, and, secondarily, if necessity should require it, on the fundamental value of the ground. Through this scheme everyone is enabled to become his own landlord, by taking up virgin Crown land, and even old freeholds that are encumbered may, by this scheme, be speedily redeemed; so that the scheme is of immense benefit to old farmers, old homesteaders, old settlers, and landowners, as well as to intending new selectors. I can assure you, gentlemen, that it is simply by the aid of the agricultural credit that the European farmers can now subsist, and keep themselves quite independent of commercial banks, money-lenders, and so on. If banks can issue notes on the security of small deposits of other people's money or deeds, why cannot we landowners and farmers do the same on the security of our own land? Our own notes, secured on our landed properties, would be substantially guaranteed, and a hundred times safer than bank-notes. When we ask a loan from a money-lender or a bank, we have to give them our deeds, and it is on the security of our deeds that they give us the money—generally in bank-notes, which in reality are guaranteed by our deeds! Therefore, why are we so foolish as to trouble them to hold our deeds and print bank-notes for us, and why should we pay very dearly for what in truth is "our own"?

Should we not, on the contrary, keep our deeds, put them together in our association, and on the guarantee of these deeds print and issue our own agricultural notes of credit? Would not the public and the mercantile community attach more trust and confidence to our notes issued on a specific security of specified deeds of land than to notes issued by banks whose business is hinged on goods and chattels more or less perishable? The idea—the principle—is as clear and simple as noonday light. But, furthermore, why should we pay interest for a credit created and sprung from our own properties? Is not this totally absurd and nonsensical? In Europe, of course, the farmers carried on the scheme themselves, but in Queensland, where farmers are as yet

to be made, the Government should undertake the task, until we are in sufficient numbers to carry the business ourselves as in Europe. I have so arranged the scheme that the credit assistance is given for 5 years; after this, 10 years are allowed for repaying the advances in 10 yearly instalments, which can be made in agricultural notes. Only a small charge, say of 2 per cent., will be made for administrative expenses. Necessity demands from us also to establish our own agricultural credit, as necessity had demanded it from the European farmers. Remember, gentlemen, that as the warehouses and factories are the securities for the merchants and tradesmen to obtain their credit, so our lands, our farms, our growing crops, our landed homes are the securities to obtain credit for ourselves and by ourselves. Our farm—our home—is our bank. It is now left to us tillers of the soil to do our duty to ourselves and our children, to assert our rights, to recognise our privileges and maintain our position in the community—in a word, to create and establish our agricultural credit and use it for ourselves and through ourselves either by agricultural associations or the already constituted divisional boards or by district agricultural councils to be elected by the farmers only under a special Act to be passed. The Premier—the Hon. J. R. Dickson—has promised to do something in this direction during this Parliament, and it is now left to us to wake up Government and Parliament, and get them to establish the agricultural credit, and not merely throw dust in our eyes with promises of facilities for us to form societies and borrow money from people total strangers to our class and diametrically opposed to our interests. Gentlemen, if I have succeeded in this quarter of an hour in clearly pointing out the nature and advantages of agricultural credit, it will now only remain for you to express your opinion here, and in your respective districts, so that the scheme may soon be put on the statute-book of Queensland. Then the labour question will be partially done away with, as very few will work for wages when everyone may become his own landowner—his own employer. Then an honest man, a tiller of the soil, will see the fruit of his honest work turned into his own capital, created by himself through the agricultural credit. Then the present social warfare between *capital* and *labour* will be closed, as *labour* will become its own *capital*! Then our millions of acres of splendid virgin soil will be converted into smiling farms, studded with happy homes. Then a free, independent, and prosperous yeomanry will spring up, who will be an impregnable bulwark to our national freedom, and become the whole country's pride!

The following is a draft of Dr. D. Thomatis' Bill:—

AGRICULTURAL CREDIT BILL.

PREAMBLE.

In order to encourage land settlement and to better develop agricultural and pastoral resources, be it enacted as follows:—

1. There are two classes of settlement on Crown land—viz., (a) Agricultural, (b) Pastoral.

PART I.—AGRICULTURAL SETTLEMENT.

2. The selector of a confirmed selection may make application for agricultural credit in three copies—one to the District Land Commissioner, the other to the Divisional Board (when the District Agricultural Councils are constituted by a new Act of Parliament, they shall take the place of the Divisional Boards), and the third to the Minister for Agriculture.

3. The application to the Board shall be presented by one of the members.

4. The selector may apply for State advance for fences erected up to a sum equivalent to the value of material bought, exclusively of wooden posts and rails and labour; also for dwelling-house and other buildings erected to the value of material bought, including sawn timber, but not the labour.

5. If the selector proves that he and his family have resided continuously on his selection for the last six months, he may also apply half-yearly for an advance of ten pounds sterling for every six months' residence of each member of his family over 18 years of age, provided after the first two half-yearly advances he yearly obtains from his land marketable crops to the value of at least two half-yearly advances.

6. The selector may also apply for advances on permanent improvements in the shape of scrub-clearing, ploughing, cultivation, and planting to the amount of half the value of such improvements, and also of half the value of the marketable products cropped on his land.

7. At the expiration of five years from the date of the first advance, all advances cease.

8. Agricultural selections must be cleared and cultivated at least at the rate of one-fortieth part of their area every year until all advances and charges have been repaid to the State and received a full discharge, and such portions cultivated must

be continuously kept in active and *bona fide* culture for crops under penalty, in default, of the selector being called upon to show cause before the Divisional Board and the Land Commissioner why he should not pay up all liabilities to the State, or else have his selection sold by public auction to realise same.

PART II.—PASTORAL SETTLEMENT.

9. Any pastoral selection or lease not exceeding 3,000 acres may come under the Agricultural Credit, and applications to be made in the same way as agricultural farms.

10. The selector or lessee may apply for advances for fences and buildings to the value of the material bought, but not of labour, and also for the construction of dams to the full amount of their cost.

11. Applications for advances may be made also for stock at the rate of 2s. for every ovine head over six months old, and of 20s. for every head of bovine and equine stock over one year old. Also for wool and hides for half the value.

12. All advances to cease at the expiration of five years from first advance made.

13. The fences and buildings for which advances have been granted must be maintained in good order and repair, and the number of stock must not be allowed to become less than that on which advances were calculated, under penalty of demanding payment of all advances and charges, and, in default, selling the selection or lease by auction to recover same.

PART III.—GENERAL PROVISIONS.

14. The value of fences, buildings, improvements, products, number of stock, and quantity of wool and hides shall be certified on oath by two ratepayers in the Division, and recommended or altered in two separate reports of the Land Commissioner and of an officer or delegate of the Divisional Board.

15. All applications for advances shall be advertised in a local paper a fortnight previous to the Board meeting. The Land Commissioner must be notified of all meetings specially called to deal with the applications. He may take part in the discussion, and vote. No other matter shall be transacted at such Board meetings.

16. The Board may approve or reject the application, or alter and reduce the amount.

17. The same selector may apply once every six months, and on him rests chiefly the task of proving the value of the improvements, stock, products, &c.

18. All advances approved by the Divisional Board shall be confirmed by the Agricultural Credit Commissioner, and finally granted by the Minister for Agriculture. Both Commissioner and Minister may alter the amount.

19. This Act shall in no way interfere with the provisions and operations of the Land Act.

20. The forfeiture of a selection or lease through a provision of the Land Act necessitates the forfeiture of all claims to the land, and the State has a right to further sue the selector or lessee for the amount of the advances and charges therefor.

21. All Crown land selections or leases once placed under the provisions of the Agricultural Credit Act are considered mortgaged to the State as first charge for all advances and expenses until a full discharge is granted by the State, which shall be advertised in a local paper.

22. Neither insolvency of the selector, or lessee, or owner, nor orders from the Law Courts for debts, shall affect the title to a selection or lease under the Agricultural Credit Act until a full discharge is granted by the State.

23. At death of applicant, the heirs take his place in all rights and liabilities to the State.

24. In case of transfer, or sale, or private sale, the new transferee takes the place of the original applicant in all rights and liabilities to the State.

25. For freehold land, the owner may apply to come under the provisions of this Act if he gives first mortgage to the State, and all other private liens, if any, become second security, provided it be also covenanted that no action at law for foreclosure or forced sale for these private liens be taken until a complete discharge is granted by the State, except on an order of the Board for rates and taxes, and for yearly interest on private mortgages, all of which to be recovered from crops, wool, or hides, but from nothing else.

26. Mortgagees on freehold properties have no claim on State advances, except on the yearly interest for their loans, and not for arrears, and at no higher rate than 10 per cent. per annum, and for an amount not exceeding one-tenth part of the State advances granted.

27. Freehold properties whose private mortgagees will not consent to come under the provisions of this Act shall not be admissible to the operations of this Act under another owner or lessee.

PART IV.—STATE CREDIT NOTES.

28. All land credit advances shall be made in State Credit Notes of one pound each.

29. These notes shall be issued by the Credit Commissioner, and bear the date of issue.

30. These notes shall be legal tender within the colony, and the State guarantees their payment in gold after ten years from the date of their issue.

PART V.—REPAYMENT OF ADVANCES.

31. When the period for granting advances is closed each borrower shall receive a statement of his account with the State, consisting of the amounts borrowed, and a charge for expenses at the rate of 2 per cent. per annum to date. This statement shall be published in a local paper.

32. Every subsequent year the borrower shall pay one-tenth part of the amount in the statement, in addition to the interest of 2 per cent., until all indebtedness is repaid, but the borrower may repay any time during the ten years, and receive a full discharge.

33. Payment may be made in State Credit Notes, which shall be destroyed by the Commissioner.

PART VI.—ADMINISTRATION.

34. An officer styled "Agricultural Credit Commissioner" shall be appointed as the executive head by the Governor-in-Council for no less than five years. His office shall be attached to the Department of Agriculture.

35. The District Land Commissioner or his deputy shall be an advising officer to the Credit Commissioner and the Divisional Board.

36. The Minister for Agriculture may appoint Settlement Inspectors to report on the improvements and progress made on the lands placed under the operations of this Act.

DISCUSSION ON TWO PREVIOUS PAPERS.

Mr. W. TOFT (Rockhampton) was afraid Mr. Peek's scheme of an honorary directorate would hardly be workable.

Mr. W. DEACON (Allora): As far as I can understand it, the scheme underlying Dr. Thomatis's paper is the lending of money to farmers by the State, and we know this is no new principle. The Government adopted it when they introduced the Agricultural Lands Purchase Act—that is to say, they bought the farms first and really lent the money, so that the farmers might acquire the land, the farmers being given a series of years in which to pay for it. I understand this matter is to be brought before the Parliament this session, and we might therefore give some consideration to it. It may be said, why should farmers have money lent to them by the State more than any other business people? Well, money-lenders do not look upon farms as the very best of security, although I do not know why, for in my opinion they are the best. Farms, however, are more or less remote from the towns, and agents cannot inspect them without trouble. Some years ago, some farms were liable to be abandoned, but I am certain that this will very rarely occur at the present time. In what manner the assistance should be rendered, is a question for the consideration of the farmers and the State, and, for my own part, I prefer the New Zealand system. There, they buy estates and cut them up, and instead of requiring that the farmers should pay all the money in a certain number of years—say interest and principal in twenty years—they give the farmer the option of obtaining a 999 years' lease, and he only pays 4 per cent. He can also buy the land outright for cash or pay for it over a term of years. Against their 4 per cent., we in Queensland pay 5. If anyone reads Mr. Reeves's book on these New Zealand settlements, he will see that they have been a success. With regard to other parts of Dr. Thomatis' paper, I think a good deal is visionary. The ideas are hardly practicable, and I do not think, if he hands his Bill to a member of Parliament, that that member will earnestly attempt to bring it before the Legislative Assembly. Dr. Thomatis, doubtless, considers Mr. Peek's paper 20 years behind the times, but I think Mr. Peek's scheme is well thought out, and that it is, to a certain extent, practicable. This issuing of notes is all very well,

but paper money only represents solid cash, and it is of no use unless the value is there. Take Paraguay, where the paper dollar which ought to be worth 4s., is only worth really 7½d. That is the inevitable result of issuing money that is not immediately redeemable. The point with paper money in these colonies is that you can always redeem it for gold at a moment's notice; and in all countries of the world where paper money maintains its value, that is the system in vogue. Dr. Thomatis' principle may have been successful on the Continent, but I am afraid it is not adapted to our conditions. If we could get co-operation amongst farmers to be successful, it would doubtless spread, but, as far as my recollection goes, it is generally a failure. The only instances that I can recall of its being successful is where small knots of farmers have associated themselves to buy a threshing-machine or something of that sort. Co-operative creameries, too, have done well, but I regret to say that a big dairy factory that we established on this principle ended in a complete failure.

Mr. W. D. LAMB (Yangan): We have tried co-operation in Queensland for some considerable time, and up to the present I must say that it has been a failure in the majority of instances. I am connected with the Warwick Farmers' Milling Company. We live certainly, but we have to spend an enormous amount of time to keep the thing together—in fact, more time than we can afford. I only know of one successful co-operative company, on anything like a large scale, that has been successful on the Downs, and that is the Greenmount Dairying Company. I believe it has been a success, but, on the other hand, I am sorry to say that the Allora Co-operative Dairy Company has been a failure. With regard to the help the State is giving in connection with settling people on the land, I think it is doing grand work. The Warwick district was the first, I believe, to try the repurchase principle, and at present on Glengallan and Toolburra a number of men are doing very well: men who would have not been able to obtain land otherwise. The State is doing splendid work in encouraging people to settle on the land, and in this way I think it is doing more good than all the co-operation in the colony put together.

Mr. G. MUNTZ (Mosman): I have been in Victoria, where co-operation obtains to a great extent, especially in the matter of creameries. As you are aware, at the time when things were so bad in Victoria, the matter of the best means of finding a market for the product of the dairyman was taken into consideration by the Government, and the first thing done was to encourage the establishment of creameries, with the result that at the present time the whole of the coastal portions of Victoria are studded over with them. The same thing will apply to other industries, and the success of Victoria to-day has been built up upon these creameries. If co-operation has been successful with creameries, I think it can be successful in the case of other phases of the farming industry. With regard to the scheme propounded by Dr. Thomatis, I think it is impracticable at the present time. In Victoria they have the credit foncier system. The Government have appointed three commissioners, and instead of issuing notes they issue debentures, which are usually taken up by the Savings Bank Commissioners—with what is really the people's money. Instead of giving notes, hard cash is issued, and these commissioners have a Government valuator, whose integrity is undoubted. Two-thirds of the Government valuation is advanced on securities at 5 per cent. interest, thus enabling farmers to get money cheaper than the banks would lend it at, and I understand the system has been a great success. I see that another issuing of debentures has been made and taken up by the Savings Bank people. The matter has been such a success, in fact, that the commissioners are flooded with applications, and the latest reports show that the Government is quite satisfied with the business done as well as with the securities tendered.

Mr. P. McLEAN: The last speaker forgot to add that the Victorian creameries were greatly stimulated by the bonus given by the Government in connection with the export of butter. Some years ago Victoria was in the happy position of having a surplus, and the then Minister for Agriculture

succeeded in securing a quarter of a million of money for his department, and a large portion of it was devoted to bonuses. The first bonuses were paid on the export of butter, which so stimulated the dairying industry as to result in the present system of creameries. With reference to the village settlements in New Zealand, I have not had the pleasure of reading Mr. Reeves's book, but when in New Zealand, about twelve years ago, I made an investigation into the village settlements there. Of course, we progress with the times, and doubtless the New Zealand Government has progressed. The village settlements in New Zealand were started from the same causes which started them in Queensland—namely, to find employment for the unemployed. But the Government, in starting them, made a complete blunder of it in the areas that they set apart for the settlers. I inspected those settlements, and have still plans of them, and the areas that the people were put on ranged from 5 to 40 acres of land. The Government advanced a certain amount of money for house-building and fencing. I remember meeting a young farmer in the neighbourhood of one of the settlements, and he told me that before the Government sent the unemployed to take up these small blocks he had been able to find employment at times on the roads in addition to the work he did on his own farm. After the establishment of the Government settlement, however, the old settlers were compelled to leave the district to seek for employment when they desired it, and this was the only one of those settlements which could be called successful. It was particularly fortunate as regards land and market, being in the immediate vicinity of Timaru and Oamaru. We know the results which followed the efforts of the Government in this direction here. They were a failure in every instance, and in the early days, at any rate, the settlements were a failure in New Zealand.

Mr. R. S. AIKEN (Gooburrum): To improve the position of farmers, one gentleman has read a paper to assist the farmer, and the other gentleman has written a paper asking the farmers to assist themselves—two different things. I differ with them both, and maintain that the present unfortunate position of the farmer in Queensland is caused simply by himself. With regard to farmers in the Bundaberg district in particular, who are not in a good financial position, it has been caused simply by the fact that money has been too easily obtained, or, in other words, it has been too cheap. It would have been better for those farmers if the money had been dear. In driving about Mackay a day or two ago, I noticed that there were a number of sugar lands lying idle, and a number of acres of ground that were not being used. I take it that the cause of that was that those who had been working them had failed for exactly the same reason as those in the Bundaberg district—that is, the money they obtained was obtained on a false basis. It was obtained by their handing over their deeds, and, on the strength of the deeds, they obtained advances on what I call the unearned increment. They expected to pay back this money from the earning value of the ground. Two different things. A man may obtain a selection from the Government at from 15s. to £1 per acre, but, as population increases, the land increases in value to £20 per acre. The owner gets short of money, goes to the bank, and, on the strength of his deeds, he obtains an advance of £15 per acre. He obtained that ground for 15s., and population could not possibly increase its earning value to that extent. Population, however, enabled him to borrow this £15; but when he came to pay back this money which he had borrowed on the unearned increment, he failed. Had the difficulty of obtaining money been greater, probably he would still have the land to-day. We have at the present time a sympathetic Minister for Agriculture in the person of the Hon. J. V. Chataway, and I sincerely hope he will not be carried away by ideas emanating from what I may term a morbid mind, certainly not a practical one, in the direction of assisting us farmers. We have a good man in Mr. Chataway, and, should he advance any scheme to assist farmers, I trust he will make quite sure that in his endeavour to help them he is not hastening their ruin.

Mr. J. HUDSON (Rosewood): If I were lending money, I would be sure the security was ample, and that there was little danger of my being let in

There may have been farms that have been abandoned, but, if there are, I know of very few of them, and if they have been abandoned it has been owing to a too high rate of interest and a bad bargain. A man naturally asks for as much money as he can get; and if the financial institution is so foolish as to lend more money than the place is worth, then the blame is with itself. If a man, however, is charged a too high rate of interest, how can he be expected to pay it and live? I think co-operation is a grand thing, and one which we should encourage in every way. I have in my eye a number of co-operative creameries that have sprung up in our district; and if we go on, we shall do greater things yet. Mr. Peek deprecates Government aid in the shape of lending money, but I differ with him. If a municipality wants money, it can get it cheaper through the Government than in any other way, and I think farmers could also get it much cheaper through the same source.

Mr. T. MACKAY (Cairns): Mr. Aiken stated that the earning value of land was not increased by population. The earning value of land depends upon communication and other things, and people taking up land away from settlement are handicapped by want of roads and railways, which they cannot obtain until increased population comes. Therefore, I say that the increase of settlement largely increases the value of the land. In parts of the Cairns district, 10 or 15 years ago, we had no communication with markets, but now, owing to tramways, &c., the value of the land has increased a hundredfold. Its value has increased in every shape and form, and this increased value is owing to the increase in population.

Mr. C. F. M. FISCHER (Zillmere): With regard to Mr. Peek's paper, I have been casting about in my mind, especially since he read his draft Bill, to think of something to which it could be likened, and the only thing which occurred to my mind is a Chinese lady of high caste. I understand that, owing to her feet having been compressed in her childhood, it is difficult for them to carry the body, and the lady is consequently rather unfitted for the duties of life. I notice in Mr. Peek's scheme that he insisted that those who entered into the co-operation should be shareholders. The shares, if I understood rightly, were to be not more than £1 each, and no one was to be allowed more than 20 shares. When he further elaborated his scheme, its machinery seemed so large that I thought of the Chinese lady. The weight of the machinery and the things that were required to be done were utterly out of proportion to the size of the feet. I have not had much experience in co-operation, but I have still had a little, and, so far as theory was concerned, I used to be very fond of it. When we came to put it into practice in our district amongst ourselves, it did not somehow work very satisfactorily, and before very long our company went into voluntary liquidation. I can understand co-operation assuming such great proportions in some of the older countries of the world, but nearly all of these voluntary unions that have been successful have been brought about by external pressure, and this pressure has been so severely felt by certain individuals that combination is brought about even against their natural inclinations. This pressure, too, keeps them together until the organisation becomes so strong that dissolution is not easy. But I am thankful to say that that state of affairs has not yet arrived in Queensland so far as our farmers and agriculturists are concerned, and I trust it never will. I think under ordinary circumstances we manage fairly well in our individual capacities, and I think that that is one of the reasons why co-operations have taken so little hold of the agricultural population of the colony. When the time comes—and I trust it is far distant—as it has come in other countries where the competition was so keen and the pressure from without was so great, and where the Government in its wisdom or unwisdom utterly refused to assist the farmer in the manner recommended by Dr. Thomatis, no doubt co-operation will have to be resorted to as the next best thing. When the state of affairs arrives, however, that will necessitate co-operation, I am afraid that it will have to start on bigger feet than those outlined on Mr. Peek's scheme—that is, if it is to be of any practical use, and not for ornament. In connection with co-operation, it might be just as well

if I concluded with a few statements of my own experience, and it will also show how outside pressure brought about co-operation in our own case. Eight or nine years ago, the pineapple industry, in which we are much interested in Zillmere, was beginning to arrive at that stage of production which necessitated finding an outside market. Prices were getting very low, and we looked about for some means of extending our market. We came to the conclusion it would be best to co-operate, and we finally formed a limited liability company for the purpose of canning our surplus fruit. We started beautifully, with everything nicely arranged, but after we had made up one year's crop, and had sent our produce about in different directions, the venture did not prove so successful as it had been painted. As is generally the case where people drift into co-operation, money was not too plentiful with them, and when the second call was made very few answered it, and the result finally was that the company went into voluntary liquidation. However, I am pleased to say that our experience has not been the experience of all co-operative societies.

THIRD SESSION.

TUESDAY, 27TH JUNE, 1899, 2.30 P.M.

Business was commenced by the reading of the following paper:—

THE STATE IN ITS RELATION TO THE FARMER.

By E. SWAYNE, Homebush, Mackay.

I do not propose in the following paper to enter into a learned dissertation upon the relative functions of the State as regards the agricultural industry of this colony as a whole, but more directly to draw attention to those features which I believe are of importance should we at any time decide that an organised effort should be made by the farmers to secure attention to their requirements at the hands of this or any future Government. It is commonly said that farmers are notoriously the least satisfied section of the community, and that it is the farmer's privilege to grumble. I hope to be able to show in this paper that if he does at times grumble he is not altogether to blame, and that he has some right on his side when he asks to be heard, and seeks attention to his requirements. It is a stale truism that all wealth comes from the soil—that the nation's foodstuffs and its clothing are the primary produce of the land, without which it is hopeless to endeavour to build up a nation, and upon which all other undertakings ultimately depend. We may admit at once that some nations may thrive by manufactures mainly, by lending money, or by acting as the changing-house of the world; but their functions would be gone were there no agriculturists to supply the basis, in their own country or elsewhere, upon which the secondary industries rest. And no nation will knowingly neglect the primary industries of the land, if it has the land necessary to enable those industries to exist, but rather it will encourage them to the utmost. Broadly, these principles are accepted on all hands; yet the tendency of most Governments is to foster those industries which are of secondary importance, tend to encourage the aggregation of large populations in the towns, and initiate at the expense of those living on the soil large manufacturing interests which cannot fail to attract men from the land it is supposed to be desirable to settle. This tendency has been somewhat checked of late, and now and again we find some reversion to the common-sense policy which one would have thought could never have been lost sight of. To make the greatest possible use of the national asset of the land may be considered the first duty and the leading political principle of all Governments; and it is with a view to showing how inadequately the conception of what the farmer wants, and has a right to ask for, that this paper has been written. We Queenslanders at the present time have not a very great deal to complain of, though the conversion of our statesmen to the policy of pushing forward the agricultural industry is of somewhat recent date. Under the tariff of Sir Hugh Nelson, many of the implements we use on our farms are permitted to enter the country free of duty; but there is still much more to be done to relieve the farmer of the burdens cast upon him for the benefit of the whole community. His foodstuffs are still taxed, and this means not only greater payment by him for articles of his own consumption, but also increased cost of feeding the labour which he employs. In the same way the ordinary cost of clothing is increased, and the State might well consider the advisableness of reducing these lines, and transferring the obligations of finding revenue to those who are not

satisfied with the simple fare and the working clothes and the men he employs. In every possible form the burdens should be taken off an industry which is the groundwork of the prosperity of a State, and which, in a colony such as this, is the groundwork of the successful and profitable utilisation of our national asset, the land. Having freed the farmer of the burdens upon his industry, the State has next to remove the trammels of ignorance. It must be confessed that many are farming in this colony who have had no training before, while few have been fortunate enough to secure that practical education while alone entitles a man to rank as a farmer of the first order. Yet it is a curious commentary on the way in which the agricultural industry is regarded, as compared with other branches of industry, that agricultural education has only been brought to the front after years of agitation, and long after the State has initiated the system of spending thousands of pounds annually upon and subsidies to technical schools for teaching all manner of subjects entirely foreign to agricultural. Even in our national schools there is little or nothing of the great primary industry of the country taught, and our youngsters, and those of the towns, grow up with a fair groundwork of knowledge to enable them to enter into commercial pursuits or adopt learned professions, but with practically no information as to the great subject, which is generally admitted to be of the first importance. It is hardly asking too much to seek to have an elementary agricultural education added to the bookkeeping, smattering of Latin, and inkling of music which at present is conferred at the expense of the whole community, including the farmers, upon the children of the country. There is a tendency to regard any expenditure on behalf of agriculture as a doubtful benefit to the community, because no immediate result, in £ s. d., is to be observed; but he would be a bold man who would say the same thing of the money expended in helping our schools of arts, our grammar schools, or even our primary schools. Yet surely we have a right to ask of the State that we shall have, always and regularly, at least no less advantages in our calling than are conferred upon those engaged in the secondary business of distribution, but I hope and believe that the outcome of these gatherings will be that the farmers of the North, South, and West will arrive at a mutual understanding that will enable them to combine both in the co-operation and disposal of their produce, and by, perhaps, through the exercise of a little give-and-take in connection with any prejudices that may have arisen, "for after all our interests on all important questions are identical," the formulation of a platform, to be supported by us all, that will contain our legislative requirements as a united body. The fluctuation of party Government would then give us little concern, as we should always be strong enough to protect our common interest; and next to education I think we may place the necessity of the Government assisting the farmer in the matter of labour. In this respect not only the farmer but the labourer himself would largely benefit. I see no reason why the example of other places should not be followed in Queensland, and a direct effort made by the State to keep the labour of the colony distributed in those centres where it can find remunerative employment. Happily we have not recently experienced much of the unemployed problem in Queensland; but if to-morrow large numbers of men came into a town and said they were unemployed, there is little reason to believe that an official could be found to place before them information as to the places where labour is required, and the rates of wages to be obtained. Instead, however, a police magistrate would dole them out free rations, until their constant applications for relief would force him to tell them to go elsewhere. I contend that it is the duty of the State, both to the farmer and labourer, to see that full value is obtained for all *bonâ fide* labour in the colony, and that each industry should have sufficient labour to carry on its production. In the matter of legislation we are still far behind the times. Agriculture in this colony lacks nearly all the progressive legislation of older States. The farmer can be defrauded with bogus fertilisers, and he has no remedy that is worth calling one. Agricultural drainage is almost an impossibility, except where groups of farmers can be got to agree among themselves; whereas it may reasonably be contended that no farmer should be allowed to stand in the way of the progress of his neighbours. Then, again, the Government organises the people of the colonies to carry out many necessary matters, such as local government, harbour control, &c., but we have yet to find the Government taking equally energetic steps to organise the agriculturists, so as to enable them to successfully manage their business of production and export, though the importance of these is invariably admitted on all hands. In money matters, the State has fitfully helped the farmers, but such questions as the limitation of mortgages, cheap money advances, and the many other questions affecting the financial position of the agriculturists should be placed on a properly organised basis—the one clear and distinct system that can be understood by the farmers—and make it abundantly clear that every legitimate aid is being afforded them by the State.

It is not a wise thing, in my opinion, to help one branch of agriculture more than another. It has a tendency to create a feeling of distrust between the farmers, which is used with effect by demagogues and pretended farmers' friends for their own purposes, and to the general disorganisation of the farmers in their relations with the body politic. Lastly, I would touch briefly upon the question of the franchise. I know I am on very debatable ground, but I contend that the farmer should look the position squarely in the face. Now he is just one man out of many. He produces and exports and pays the interest bill, while others live more or less directly upon the fruits of his labour. Yet so little is the importance of the farmer recognised that so long as he has one vote there are plenty who contend that they should rest satisfied, even if his vote is discounted twenty times over by an equal privilege given to every other person in the country, whether he produces or whether he is a bird of passage. In the foregoing I do not wish it to be thought that I am writing in a petulant spirit or cavilling against those in power. We can all admit that the progress of agriculture in Queensland of late years affords ample evidence that the great producing industries are not hampered more than elsewhere, but I am urging further advance and greater recognition of the importance of agriculture throughout Queensland. I trust I have succeeded in drawing some attention to a few vital points on the main question, which I regard as the organisation of the agricultural interests. Our aims as producers from the soil are identical, and we should stand together not only in this colony but throughout Australia. It is a scathing commentary on the supineness of the farmers that while all economic writers admit the great and indeed the paramount importance of agriculture, that that importance is apparently forgotten by the great bulk of the people whose political privilege it is to have a determining voice in directing the State's relation to the farmer.

On the conclusion of Mr. Swayne's paper, the discussion, which had been adjourned for lunch, was resumed.

Mr. G. W. POTT (Proserpine) : Mr. Fischer took rather a pessimistic view of co-operation, but for my own part I consider it an admirable system, and I have been connected with central mills for 5 years. The central mills are established on the co-operative principle, and they have done a vast amount of good to the country. Mr. Peck's paper on co-operation I consider an excellent one, and I must congratulate him upon it. The views expressed therein are in accordance with my own; and although there are one or two little points upon which I do not agree with him, I shall let them pass. If, as far as it extends to the central mills, co-operation were carried out in the spirit in which it was intended, it would be productive of far more good than it has been. As the central mills now are, there is a certain amount of farce in them, because those men owning large areas of land are benefiting by the farmers who settle upon them, reaping, as it were, an unearned increment. The value of those lands, previous to the establishment of the mills, was very small, but since then the price has gone up considerably. To a certain extent I blame the present Government for not making greater use of the Agricultural Lands Purchase Act, and not buying up all those lands in the vicinity of proposed central mills. That land, previous to the erection of the mills, could have been purchased at a very low rate—in fact, for about a fifth of its value at the present time. If the Government had done this, I am sure the central mills would have been in a far better position than they are to-day, simply because a far larger number of farmers would have been able to have settled on the land. Land in the vicinity of mills, that is now worth, say, £5 per acre, could have been purchased previous to the erection of the mills, at 10s.; and if the Government had taken it at that price, they could have let farmers have it at, say, £1, which would have resulted in much more land being put under cane. With regard to co-operation, our Government subsidises the funds of agricultural associations, and therefore recognises its value. Co-operation is a democratic principle. As for cheap money to farmers, I do not altogether hold with Dr. Thomatis in this matter, because my experience is that if a man is able to get money at a cheap rate he grasps more than is really good for him. When he takes the money he, perhaps, sees his way clear to repay it—that is, if he has good seasons. But if the season fails he has to encumber himself to pay the interest, and, therefore, I cannot support cheap money to farmers under any consideration. As far as co-operation is concerned

and Mr. Swayne's paper, I am fully in accord with it. If farmers will join together in a system of co-operation, they will better themselves to a very considerable extent. Even in the purchase of implements farmers will save themselves considerable expense by availing themselves of the benefits of the principle.

Mr. E. DENMAN (Mackay): The expression *cheap* money is, I think, a misnomer. What the farmer wants is *reliable* money. The difference between 5 and 8 per cent. never broke a farmer. If he has had it for a stated period, and one or two bad crops overtake him, he is not in danger of being called upon for principal and interest. The mills that have been closed have not been shut up through cheap money or through want of money—in fact, some of them belong to very rich men. Few farmers can undertake drainage, owing to its expense and the number of years over which its work extends. In England, some 50 years ago, the Government advanced something like £4,000,000 sterling for drainage purposes, and two years ago all of it had been repaid, with the exception of some £9,000, which shows that the Government had been able to render very necessary aid without loss to itself. As an instance of the advantages of reliable money, I may instance the case of the central mills. What would have been the position of these if they had borrowed from a private bank? After the two or three bad seasons, the money would have been called in. During the bad seasons, however, the Government made the payments of interest and redemption easier, and so the crisis was tidied over.

Mr. J. HUDSON (Rosewood): In the central mills you had cheap money as well as reliable.

Mr. E. DENMAN: If you can get the two, so much the better.

Mr. C. ATTHOW (Brisbane): Mr. Swayne said farmers were the most complaining of mortals. Perhaps they are, and perhaps they have a good deal to complain of. As he stated, they have, up to within the last few years, been the least looked after by the Governments of the day. He also said they were the most important, and I believe it is allowed throughout the world that the producers from the land are the most important part of the community. One would naturally expect that they were, therefore, most entitled to be looked after. Mr. Pott spoke against cheap money, because men would be borrowing too much, but I think, however, the Government could be trusted to see that this did not occur. Mr. Denman said we wanted more reliable money, but I think if both were put together—i.e., cheap and reliable—we would come very close to the point at which we are all aiming. Mr. Peek referred to local co-operation, and Dr. Thomatis to general. Perhaps no doubt there is good in both, but I think we ought not to try too much at first. We all remember the fabled frog who burst himself in his efforts to reach the dimensions of the bull, and we must be careful that our efforts at co-operation have not the same fate. I was associated with the co-operative venture Mr. Fischer mentioned, and in it we had many difficulties to contend against. We had human nature to deal with, as well as a shortness of capital. We had neighbours, standing out of the co-operation, who went behind our backs and took the markets we had discovered. It was a failure because we had not sufficient capital, and because those who would be benefited by the co-operation would not stand by it. We must not, however, take failures as an infallible criterion. Most of the banks failed, Governments have failed, and storekeepers are doing the same every year, but failure does not mean that such-and-such a thing cannot be done. It only means that it has not been done in the right way. Co-operation can succeed if carried out in the right way, if the people pull together and manage it well, like any other successful institution. The next question is, Can monetary help be given? I think it can. Can it be got from the farmers or those who live in the district where it is wanted? I do not think it can be obtained in that way, because those who would join a society would be those who would expect to benefit. Hence they cannot pay and get the benefit, too. Though people in farming districts do sometimes lend money to their neighbours, as often as not they

prefer to invest it themselves in some other way; or if they do loan it to their neighbours, they take good care to get full value in return. For myself, I think the assistance can be rendered by the Government. Thousands of acres of land have been selected in the colony, which were taken up under great difficulties, but in the majority of instances most of these selections have been paid for. When they were unproductive, the farmers paid for these lands, but now they are productive and the farmers have got them to themselves, surely they should be good security for a fair amount of money that might be loaned to the farmers to stock and cultivate them.

Mr. R. GIBSON (Ayr) advocated cheap money, instancing irrigation as a branch of farming in connection with which it would be specially beneficial.

Mr. W. THOMPSON (Childers): I think there are some good points in connection with Dr. Thomatis's paper, but with regard to Mr. Peek's scheme I do not, for the life of me, see how he is going to float a company that will be of any utility. If a man wants to borrow £500, the bank is broken; and to raise £500 altogether by the scheme, it would have to be started in a district with a very thick population. I have had some connection with co-operative companies, particularly with one at Maryborough, and another in my own district. In the early times, before any cane was planted in the Isis Scrub, the farmers formed themselves into a co-operative company. The shares were put on the market, half were taken up, and the affair went on for about 6 or 7 months all right. The store they had, however, got chockfull of produce; so full, in fact, that the directors made an inquiry into the affairs of the company. The manager was dismissed, and one of the directors took charge. He then brought all the stuff up to Mackay for sale, and on his return said that the whole proceeds did not pay the expenses of the trip. That about saw the end of that co-operation. If you want money, you had better get the Government to start a bank with a capital of £4,000,000 or £5,000,000, lend it out at a low rate of interest, and then you have something practicable, but I want people to understand these co-operative businesses are not worth the paper they are written on. Have nothing to do with them. I have been in two others, and lost money through them. At present I am in a co-operative butchering affair. It has been the soundest of the lot, but, although it was started three years ago, I have not yet got a dividend from it.

Mr. M. O'KEEFE (Blenheim): I speak from a producer's point of view, and I hold it is not right for the farmers to be continually going to the Government for assistance. I think it is within their own power to remedy their disabilities; and the solution is in co-operation. For the success of co-operation, you have only to refer to the neighbouring colonies. You have only to go to the Tweed River to find the flourishing co-operative dairying factory at Byron Bay. There, the monthly cheque of many of the shareholders is £100. Then there is the Farmers' Co-operative Company in New South Wales with a yearly turnover of £300,000, and we have all heard of the great Manchester Co-operative Company. Co-operation at Gympie has proved a success, as it has also been in my own neighbourhood. The difficulty is that the farmers will not be united—that they will pull one against another. Whether this is the cause of their hitherto isolated position, I shall not say; but this brings me up to the fact that these Conferences are going to do more good than was anticipated. They are bringing people together from all parts of the colony, and by the interchanging of ideas a good deal of the ignorance that has been shown in the past among the farmers will be done away with. People will be able to see the way to rectify their own grievances and act without going to the Government, for so long as we have no independence of our own so long will we remain in a poor position. I am a very earnest co-operator, and I never yet heard a man raise his voice against co-operation who was not interested in the middleman's trade. Do not run away with the idea that I hold socialistic views, for I think that instead of trying to crush out the middleman we should meet him as business men to business man. If we try to crush him we will probably fail, but I have not the slightest doubt that we can establish co-operative

companies as sound as any in other countries and colonies. We have in the Lockyer a farmers' co-operative company started with £1000, £500 of which was the value of the property, and the balance the paid-up shares. That society has proved to be an immense success, not only in the way of supplying us with stores, but also in assisting us to put our produce on the market. Our agricultural societies should endeavour to more than hold an annual show, for that is all the majority of them at present do. They should endeavour to assist each other and try to bring about co-operation, so that, say, the Mackay association would assist the Lockyer society to put Lockyer produce on the Mackay market, and *vice versa*. If our societies were to work on a proper basis, they would be able, without any great cost, to act as agents for one another to place produce upon the market. Why should not a co-operative store in Mackay send their orders for sugar to Mackay, and why should not our produce be placed upon the Northern market without going through agents? Last year at Rockhampton I went through the produce stores, and it so happened that I recognised a consignment of chaff that had left Laidley some 6 weeks previously. It was sold at Laidley for £1 19s. a ton, and was being sold at Rockhampton at £6. If our societies were to put their shoulders together, that produce would be placed upon the Rockhampton market for 50 per cent. less than it was.

Mr. J. E. NOAKES (Maryborough): Both the Maryborough Dairying Company and the Bundaberg Co-operative Butter Factory are doing well; and with regard to the question of cheap money, I may say it is hard to get private individuals to lend money on farms. For one thing, the mortgagee is liable for 6 months' wages for any people working on the place; an advantage in the Government being the lender would be that it would not sell the borrower up so quickly as a private institution.

Mr. J. E. LEASK (Gooburrum): As one of the directors of the Bundaberg Co-operative Butter Factory, I must say that it has been a great success. We have £2,300 taken up in shares. It is two years since we started the factory, and we have now over 150 milk-suppliers, the factory being a great benefit to a great number of small farmers whose land was really not fit for agriculture. Our profit last year was £100, and at the end of this month we hope to be able to show a particularly successful half-year. Co-operative concerns depend a good deal upon the men who run them; and I am pleased to say that, so far as I can see, we are making a success of ours. We are, moreover, doing good to the district, particularly in the way of attracting new settlers.

Mr. H. CATTEEMULL (Woongarra), in reply to the last speaker, said that in his opinion the profit of the Bundaberg Co-operative Butter Factory was more on paper than in reality.

Dr. THOMAS (Cairns): Two papers have been read—one by Mr. Peek, and the other by myself. They may be cognate, but they tend to different things. The object of Mr. Peek's paper is to improve the present condition of co-operative societies, and, if that is the purpose for which he read it, it is a good one. Agricultural associations in Queensland are open to very much improvement, and I think Mr. Peek's paper will tend to that improvement. My scheme is purely to create agricultural capital—to assist us to create capital for ourselves, out of our own security, for our own farms. My paper proposes to you to decide to-day at this Conference whether you want to create your own money—of course, to do it through the Government, because we are still too small to do it ourselves. My scheme is not to borrow cheap or dear money: it is to create our own money, from our own property, our own security; and we only ask the Government, say, for a year or so to do it for us, or rather to start the machinery going—to turn the steam on—and then we will be able to do it ourselves. I am not here to ask State aid or State money. I am here to demand our own money. That is what I said 22 years ago before 2,000 delegates from all parts of Europe, from Sicily to Finland; and we got it. I was then called a visionary, as I have been to-day, but we got it. I believe that the present Ministry, who are taking great interest in agriculture, intend bringing a Bill before Parliament in connection with this subject. I do not care whether it is my Bill, or anyone else's, so long as it

contains the substance of my scheme. I may mention that this scheme has been presented to the Minister, through the Premier; and your Chairman to-day, Mr. Chataway, replied to me six weeks ago, stating that he had read the Bill and submitted it to a practical bank manager, who had told him he thought a good deal of it. Some gentlemen said we do not want cheap money—that it is dangerous. Perhaps it is dangerous for those who do not know how to use it; but in any event it is neither cheap nor dear money that we want, but our own. Mr. Peek mixed up co-operation with banking. A bank starts on a shilling-a-year subscription—a bank whose first business, if it wanted to put up a shed, would be to apply to another bank for a loan. If we have got credit enough when we are united to get a loan from another bank, I say why not go straight to the goal and do it ourselves?

Mr. F. W. PEEK (Loganholme): The Bank of Italy was started without Government support, as were also the German banks, the Government in the latter case eventually stepping in. It was the same with Austria. These banks were first started by the people themselves, not on a paper currency, but on the sterling cash of the realm. For the greatest amount of good to be obtained from money it must be used carefully, and in its management lies the chief success of co-operation. With regard to what Mr. Fischer said about the Chinese lady, I may say that the association I represent is a small-footed one. We begin at the root, and to do so you must prove to your farmers in your own district the benefits of co-operation. My association has done a very great amount of good amongst our farmers financially, and as an instance I may mention that in one purchase we saved £60 by co-operation. The farmers wanted 43 tons of seed potatoes altogether, and to get it they advanced £180 to me, I doing all the work. I wrote to Mr. McLean, of the Agricultural Department, and he suggested that I communicate with the Tasmanian Secretary for Agriculture. I did so, and received particulars as to the best source from whence to procure the seed. When the order was sent, it was accompanied by a cheque, and I may tell you that the 43 tons of potatoes we procured were not obtained from any one man, but from a co-operative company of farmers, and by us thus dealing direct we saved the £60 I have mentioned. I believe in self-help, and consider it the secret of success. Mr. Toft questioned whether directors could be got to work in honorary capacities, and I may say it applies to districts where the farmers are close together. In the matter of capital for drainage purposes, one of our branches at Pimpama Island took up drainage, and with successful results. In this case they gave their labour, as capital was not wanted as matters stood, and success in one case shows that under the same management and under the same rules success will follow elsewhere. It is only by the affiliation of societies that greater results will ensue, and all that we ask the State is to see that each individual association is carried on on a firm and solid basis.

Mr. E. SWAYNE (Mackay): I am not one of those who believe the Government should establish a shop where a sovereign would be sold for 10s., for if the Government did bad business we all would suffer. I do, however, think that when good security is forthcoming that it would benefit the community at large by supplying the primary producers with reliable money at a low rate of interest. Of course the security is always the great trouble, and the legislation of the southern colonies has insisted on freehold security. I understand the Government are going to introduce legislation on this subject, and would therefore ask if something on the Rewfeisen system could not be introduced here. We only need to go to other countries to see what is being done in the direction of agricultural co-operative production. In Denmark, by co-operative production they have captured the British market in respect to dairy products, and in Germany the same system has greatly advanced the position of agriculturists. In New South Wales, by the co-operative sale of produce, the farmers derive very great benefit. Here in Queensland, although we have had failures, we have had successes. After I had been at the Gatton Conference 2 years ago, I went through the Downs and visited the Greenmount cheese factory. I found there that through co-operation they were getting twice the

return for their milk that they would have got if they had supplied to a private factory. Six months previous to my visit the net profit had been £800, and when the company started it had only £70. In Mackay we have not got very far, but by combining we are able to reduce the cost of our supplies by from 10 to 15 per cent., and I suppose the smallest farmer in our district has benefited to the tune of at least £10 a year through combination in purchasing. In this matter of co-operative purchases, the great question in England now is whether the combination should have a regular store, or whether they should be just a buying company simply, and I think that for the majority of farming associations the latter system is best. In conclusion, I have only to refer to the Manchester and Rochdale companies to show how successful co-operation can be.

The Hon. J. V. CHATAWAY: The schemes offered by Dr. Thomatis, by Mr. Peek, and by most of the speakers are in very many senses similar. It is true that the one proposes that the State shall help to provide the capital, or rather the capital shall find itself, and the State shall guarantee it. But it is exactly the same. If you put your name to the back of a promissory-note and that note is not met when it becomes due, it is the same as finding the money. If the State puts its name to the back of a lot of paper money and says it will be met by gold, it is exactly the same as finding the cash. But the two schemes were really founded on the systems that have been largely adopted in Europe, with some variations in Germany, in Italy, and in Austria. Dr. Thomatis differs very largely from his former colleague, Senr. Luzzati, who started a bank with £28. This gentleman did exactly the same thing that Dr. Thomatis has rather made a joke of. He went to another bank and borrowed more money, and his institution now turns over £20,000,000 annually. They did not issue paper money, but lent cash which they had borrowed on their co-operative credit. They put their credit together with unlimited liability, and they borrowed from other banks on that credit. Their next operation was to open a savings bank, and their credit was such that people rushed them with money. Money was deposited at 4 per cent. and lent out at 5 and 6. They were able to work their bank cheaply and borrow cheaply because of their credit. They were able to lend cheaply because they had no working expenses, because their directors and inspectors worked for nothing. That is the general scheme of the whole of those banks. I would like to refer to the statement made by Mr. Deacon that money-lenders did not look upon farms as the best of security. As a matter of fact, anyone who has any connection with financial institutions knows that exactly the very opposite is the case. During the crisis of 1893, the financial institutions noticed that there was no kind of security which fell so little and which varied so little as land in agricultural occupation. Mr. Deacon, I must add, is a man of large experience, and is looked upon in the Southern end of the colony as an authority second only to Mr. Kates, on the financial condition of the farmers there. During 1893 there was no property which was less shaken by the convulsions of those days than agricultural land in profitable occupation, whilst those who had advanced on town allotments, &c., had them thrown on their hands wholesale. While properties in the neighbourhood of Brisbane were surrendered to the mortgagee, and are in many cases still unoccupied or burned down, farming lands on the Downs were hardly affected at all. At the present day there is no man who can so readily borrow money as the Downs farmer, and at so low a rate of interest. I know of several institutions which have been lending money at 5 per cent. on farms. In this district 6 per cent. has to be paid on farm mortgages, but on the Downs they pay 5; and the manager of one of the largest life insurance institutions in the colony told me the other day they would have to reduce their rate of interest, owing to the competition, to 4 per cent. The main argument in support of loans from the Government is that the Government will not insist on the payment of either principal or interest, or, in other words, that the Government will not advance money on a business basis: that the Government will practically say to the borrower, "If you do not want to repay the loan you need not." We all know that this is a wrong basis to take up, and that if the Government suffers, we all as a community do likewise.

Mr. W. DEACON, of Allora, then read the following paper:—

RUST IN WHEAT—A PROBABLE PREVENTIVE.

In the compilation of this paper, I beg to acknowledge my obligations to a pamphlet on "The Making and Improvements of Wheats for Australian Conditions," by Mr. Farrer, of New South Wales, and published by the Agricultural Department of that colony, and also to a lecture by Professor Eriksson, of Sweden, delivered at the Agricultural Congress held at Stockholm in 1897, and appended by Mr. Farrer as a supplement to his pamphlet. Wheat rust to the ordinary farmer and the interested observer is a plague or disease that suddenly, in some seasons in a few days, converts an apparently healthy and promising crop, that has had all the care and culture that could be bestowed upon it, into a hideous and useless mass of rotting vegetation. The crop has shown a fine breadth all winter, has grown vigorously in the spring, has eared magnificently, and the farmer having ordered his reaper and binder has almost realised a magnificent yield, and seen in the immediate future a respite from care and anxiety, his debts paid, and a substantial reward for his industry, when his hopes have been dashed to the ground by the disease having seized and, in a few days, strangled his crop; and his anticipated yield of 30 bushels per acre or more reduced to a bushel or two or perhaps nothing. Having been a wheatgrower for many years, and lived in a colonial wheat district for more than 30, I have observed the rust in all its stages. I have seen grand crops changing colour, destroyed in a few days. I have also seen a crop apparently battling with its antagonist, hold its own bravely, and emerge from the struggle carrying a fair yield of grain, but still with that yield impaired. I have seen rust completely destroy patches in a field and leave the rest untouched; on the other hand, I have seen a field destroyed all except a few patches generally inclusive of the headlands. Rust is not confined to Australia or to tropical or sub-tropical climates. In parts of America it is very prevalent. Mr. Farrer says that in Kentucky, Ohio, and Indiana the crops are so damaged by *P. graminis*—summer rust—as not to be worth harvesting, and in Kansas it appears that there are no wheats which are not liable to be attacked by this rust. In Sweden, both spring and summer rusts are very prevalent, and it has been said that there are no wheats which will resist them in certain seasons. In regard to the above statements Mr. Farrer remarks it seems to him that our climate is so favourable to wheat, that varieties can be found that will resist both rusts. Nor is rust a new disease, or by any means a new thing. I have often thought Shakespeare refers to it when he says of a very wet time—

The ox has therefore stretched his yoke in vain,
The ploughman lost his sweat; and the green corn
Hath withered ere his youth attained a beard.

The Romans were familiar with the pest, and singularly concluded that its ravages were more severe in seasons when the nights were cold and the days very hot, whilst we, on the contrary, are more fearful of muggy days and what are termed close nights. Rust is a parasite of fungus, which in certain stages in the growth of cereals appears in various forms on different parts of the plant, and by intercepting the sap diminishes or destroys the plant's productiveness. Professor Eriksson resolves rust into five main divisions, and these again he subdivides into ten subdivisions. Of these subdivisions, the summer rust is responsible for three, one of which attacks barley and rye, another wheat, and the other oats. Now, I have never seen rust in malting barley and rye in the colony, though I have seen summer crops of rye, or crops sown about Christmas time, but oats are more or less liable to be victims to the pest. But as summer rust, and all rust is admitted to be infectious, the fact that, at times, oats grown in a crop of wheat are clean, while the wheat has been destroyed; and *vice versa*, that wheat growing amongst oats has been free whilst the oats were rusty, proves the professor's point. The rusts, however, with which I am concerned in this paper are the spring or spot rust, and the summer or streaky rust, which are the rusts that affect wheat. These rusts are called by different names, and are said to be distinct species, but my experience leads me to the conclusion that severe attacks of streaky rust are generally preceded by the spot rust. Mr. Farrer says "that experience and observation have led him to the conclusion that spot rust in this country does no material harm," and this is confirmed as regards America, by Mr. Carleton, in charge of the "Rust in Wheat" experiments carried on by the Government of the United States. The spot rust or yellow rust, or orange rust as it is called, is seen on the leaves and sometimes on the leaf sheaths but not on the stalk. It may appear at any time, for I have seen it on wheat 4 or 5 weeks old, before the severity of the winter, but it generally sets in when the wheat is more advanced, well in the shot blade and

earing. It is well to know that it is generally harmless, for many farmers have cut down their wheat on the appearance of this rust, thinking that it would eventually destroy their crop and make it even worthless for hay, and have thereby lost a good yield of wheat. Summer rust (*P. graminis*) or streaky rust attacks the whole plant, stem, stalk, and leaf sheath, and I have even seen it on the ear. It does not usually set in until the wheat is well in ear—Mr. Farrer says “changing colour.” It varies in the intensity of its destructiveness. With early-sown wheats, quick ripening sorts, and a few rust-resistant, it is often comparatively harmless. It is not so, however, with the late sown wheat; this has no chance whatever. With us wheat that is not out of danger in ordinary seasons by the middle of November can be given up. I say “ordinary seasons” because there are some seasons which from the summer being late, or very mild, or from some other reason, are specially favourable for the production of the cereal, just as on the contrary there are other seasons when the rust appears earlier than usual, really in the form of an epidemic, and sweeps from one end of the country to the other. Now, I come to the difficult and perhaps most controversial part of the subject—what are the remedies for this disease in wheat? Can this destructive parasite or fungus on our cereal plants be rendered innocuous, avoided, or destroyed? From whence does the rust originate? Does it come from some of our Australian grasses, plants, or bushes, and on which it is probably perennial? Or is it in the wheat or seed itself as what is termed a myco-plasma, only developed as opportunity and condition offer? In his lecture on the subject Professor Eriksson propounds the latter theory or hypothesis, and Mr. Farrer says “in regard to Professor Eriksson’s hypothesis of the existence of a symbiotic myco-plasma in some wheats, facts have come under my notice which have the appearance of according with it.” And modestly, as an unscientific observer, I have come to the same conclusion. Rust is infectious, yet this infection has its limitations, for of different kinds of wheat growing in rows side by side, although it spreads along a row of the same sort, or perhaps develops spontaneously throughout, yet it may not infect the next row of a different kind of wheat at all, although such row is so close that the ears and leaves may intermingle with or touch one another. There are, moreover, other limitations to infection for which I beg to refer you to Messrs. Farrer and Eriksson. The fact that on land on which a rust crop of the previous year has been burnt, the wheat is generally free from rust is not altogether against the plasma theory, for wheat plants grown on such enriched and purified soil may be of such fibre that the rust parasite cannot break through. If we adopt Professor Eriksson’s theory it follows, I submit, that there may be wheats which are absolutely free from the disease, and that there are others more or less clean or what is termed rust-resistant. Furthermore, that it should be possible to eliminate the rust from many wheats, or to do as Mr. Farrer has been doing for many years with more or less success, by cross breeding, elimination, and selection, to make or create new wheats which are free from rust. There are several wheats which are even now more or less free from rust—I mean the streaky rust—viz., Medeah, an Egyptian wheat, which Mr. Molyneux, of the South Australian Agricultural Department, informed me has never been known to have the rust; Ward’s Prolific—which Mr. Farrer says came to this country from Egypt as a stray grain in other wheat—I have known or heard of having the rust, though it is a wheat I do not like. Others are the Belatourka, the varieties of the Defiance, and Mr. Farrer says the Fife wheats, Sicilian Square Head, and Blount’s Lambrig, Budd’s Early have been free so far; and Allora Spring, originally called Pugh’s Rust Proof—though it is not a rust-proof wheat, but rather a rust-escaping one—has many of the characteristics of a rust-free wheat, viz., it stools sparingly, it has narrow, erect leaves, and fills quickly after blooming. If rust is inherent in the seed of certain sorts as a myco-plasma, we need not despair that ultimately the seed may be so treated by some chemical preparation, or otherwise, that the germs of the rust will be destroyed. Meanwhile farmers have apparently no other course before them but to sow wheats which are named rust-resisting or rust-escaping, and to be guided in their choice of such wheats by the experience of practical men, and the advice of professional experts. Now for my probable preventive, which I may say I have been experimenting with and trying for the last 16 years. And although my knowledge and conclusions are incomplete, and I can only say that I believe it to be a preventative, but cannot go so far as to say I know it to be one, I think the time is opportune for laying it before you. I have been led to do so by a paragraph in the April number of the Department’s *Agricultural Journal*. In that paragraph a farmer at the Cape says that he sowed 3 bushels of 2 years’ old seed wheat, and the resulting crop was free from rust whilst a crop alongside from 1 year old seed was rusty. He says the crop is 18 inches high and quite green. Unfortunately he does not state the crop’s stage of growth, or whether

or not it was in ear, and we cannot decide whether he refers to the harmless spring rust or the deadly summer rust. I stumbled on this old seed preventative theory 16 years ago by accident. I put in a plot of 20 acres with wheat—less half-an-acre for the time being under another crop. In a month the half-acre was cleared, and there being no other seed it was sown with chickwheat, at least 2 years old, found in some corner of the barn. At harvest, on the 19th acres, the crop was nearly destroyed by summer rust, and the yield was small; on the other hand, the half-acre crop was completely free from the pest. It matured very quickly and was cut a few days after the other. For a long time this result was to me perfectly inexplicable, but at length I came to the conclusion that the plot was rust-free because I had used old seed. The succeeding seed-time the only bag of old seed I could obtain was a bag of New Zealand wheat, but it proved to be a very bad season and I had no crop. But 2 years after that, I had sufficient old seed of my own which I had saved for the purpose to sow 20 acres. It proved to be an exceedingly rusty year, the worst in my experience, and the experiment failed, but it *just* failed. Until it actually collapsed I was certain that it would be a success. The wheat was one which we no longer grow, for we cannot—namely, White Lammas. Had it been one of the many sorts which we now grow, I feel sure it would have been a success, for it had all the characteristics of a rust-free crop. I had mixed lime with this seed in bags to keep the weevil away, whether the lime not only protected the seed, but the rust germ as well, I cannot say, but in keeping seed over for the next season I have never since then mixed lime with it. I then for several years kept some seed over for the next year, but until 2 years ago, the rust has not been of much consequence in our district, or with me, at any rate. Consequently, I have never had a chance to fully test the theory. But old seed has always produced crops having all the characteristics of rust-free wheat—namely, the crop stood sparingly, the leaves were erect and narrow, and the straw tough and wiry, and the interval between blooming and ripening was in my opinion shortened. In my opinion also, the grain from crops produced by 2-year-old seed on being sown also produced an improved plant, and the improvement is not lost for several generations. Two years ago, when the summer rust was prevalent to a considerable extent, and I had 40 acres out of an area of 150 acres very much damaged by it, I had not sown any old seed, but from that harvest I saved a few bags and have sown this year. I have also put in 7 plots, with different sorts of wheat, all 2-year-old seed. Now beyond the gain or otherwise from experiment, is the theory reasonable? My paper is already too long, and I cannot dwell upon this point, but just let me draw attention to this fact within the knowledge of wheat-growers: After a total failure of the wheat crop, and consequently when no new seed is or can be saved, the farmer often falls back upon some seed which he has saved in anticipation of the failure, or by accident, and sometimes procures old seed. From observation I am sure the quantity of old seed sown is very large. For many seasons then we generally have no rust. Am I unreasonable in submitting that this circumstance affords presumptive evidence in support of my theory? In conclusion, I think this Conference will agree with me that I have said sufficient to induce the Agricultural Department wheat experts and practical farmers to test the theory, especially as the experiments required will be inexpensive.

DISCUSSION.

Mr. E. DENMAN (Mackay): Sir J. B. Lawes, some 2 years ago, said wheat and barley had been greatly benefited by the application of extra nitrogen in a form of sulphate of ammonia or nitrate of soda. I have a cutting here from an English paper, and, as it may be of interest, I shall read it. It is as follows:—

CEREAL BREEDING.

To improve the yielding capabilities of cereals has been the object of many cultivators, but if all that is said about Messrs. John and Robert Garton, two Lancashire experimenters, be true, they have succeeded not only in increasing enormously the flour-giving and straw-bearing properties of oats and wheat, but they have produced new varieties of cereals by means of cross-fertilisation. The experiments were begun about 18 years ago, and the first idea was to improve the grain by selecting the best ear in a field and the best grain in that ear, the produce of the grain thus selected being kept for seed, subject, of course, to selection and improvement every year. They have succeeded, according to some Press reports, in producing varieties the average weight of which is 60 per cent. heavier than the average weight of grains in ordinary cultivation. The breeding of new kinds of cereals and the fixing of the types

have been arrived at by the most laborious crossing of different species of grains. The discoveries are known to the British Government, but nothing has been done to assist the experimenters in the work they have voluntarily undertaken. The United States Government, however, saw great possibilities in the work that is being accomplished, and sent an expert to examine and report on the discoveries. So struck was he with what he saw, that he at once made an offer for the whole of the stocks of new cereals in hand, and also an offer that would secure the further results of experiments for the benefit of the farmers of the United States. The offers, however, were declined, as the Messrs. Garton were anxious to give the British farmer a chance to participate in the benefit of their discoveries.

Mr. R. J. BLAKE (Blenheim): I am not altogether what is known as a wheat-grower, but still I have had plenty of experience in this cereal, and have been growing it for 29 years in Queensland. I cannot altogether agree with Mr. Deacon in what he says about the use of old wheat for seed purposes being a good preventive of rust. I have sown seed wheat that I have had on my hands for over 4 years, and in some cases the rust attacked the resulting crop more than that grown from new seed. The tillage and the season I think, affect the wheat from a rust point of view more than anything else, and shallow ploughing and a fair season is the best preventive of rust that I know of. With a dropping season, there is to my mind a greater risk of rust than would otherwise be the case. I have had wheat that did not get a drop of rain after it got well out of the ground, and yet when it was harvested, a beautiful crop was the result. Some years ago, the Lockyer Agricultural and Industrial Society got a number of wheats from Victoria, and the seed of one of them, and very inferior looking seed it was, was given to me. I have grown that wheat (Leak's Rust Proof) now for 3 years, and have never seen the sign of rust on it. I sell my crop to my neighbours on Laidley Creek, where, on the heavy flat lands, it grows strong and robust, and makes an excellent hay wheat. I do not think it is a good milling wheat, although as a matter of fact I have never had it tested.

Mr. J. HUDSON (Rosewood): You all know that in the old country wheat is sown in the fall of the year. It comes up, but little growth is made until the spring. During the winter it is rooting, and when the spring comes it has a good hold of the soil. In Queensland, on the other hand, wheat grows very rapidly—too quickly in fact, and the result is there is so much flag in the beginning as to endanger the plant. The young plant is consequently not strong enough to withstand the disease, and I therefore believe in having the young wheat eaten down by sheep. I have found this an excellent practice, as the plant gets thrown back until its roots become strong and old.

Mr. W. D. LAMB: (Yangan): I must differ from the theory propounded in Mr. Deacon's paper, and for myself, I believe we are only just beginning to learn about wheat, and that we have hitherto been working on the wrong lines. The difficulty with us is to keep the wheat from getting too much straw, and we are now finding that it is best to plough the land very lightly and drill the seed in. As for rust, I think its day is nearly past. We have not been troubled much with rust since we got all those new varieties of wheat which are so much rust-resistant, and a good deal is due to the Department of Agriculture for introducing these varieties. We have been growing too many soft wheats on the Downs hitherto, but as the millers are now asking for hard kinds, we must grow what they demand. However, I do not think wheatgrowing in Queensland will be placed upon a really satisfactory basis until we begin to export, and thereby assist in removing prejudices. I am glad to say that the next wheat crop promises to be a record one, provided we can keep it from growing too strongly. We have it eaten down by sheep to keep it back, and provided we get rain, I think we shall be all right. We are now getting over all the cultivation difficulties on the Downs, and the settlement that is now going on all over that district should convince us all that the industry is going to be a great one.

Mr. P. McLEAN (Under Secretary for Agriculture): Probably the most important difficulty at present with wheat-growers is, not the danger from rust, but the danger from the millers. There are certain varieties of wheat which are

better able to resist rust than others, and cases have occurred in which varieties known to be rust-resisting have been imported by the Department, submitted first to millers for their opinion, and then, a favourable report having been received, the seed was extensively distributed to farmers. When they tried to sell their resultant crop of wheat, however, the millers refused to purchase, alleging that the wheat was a bad milling variety. When we imported the Belatourka I sent 28 lb. of it to Mr. Bellingham, of Greenmount, asked him to sow an acre and let me know the result. He sowed an acre and reaped from it 46 bushels, a sample of which I submitted to a miller whose letter I still have, stating he would take any quantity at the then top market price. This report was circulated and farmers advised to try the wheat, but when they came to sell their Belatourka, the millers refused to take it except at a greatly reduced price. Of course millers have a reason for declining to purchase certain varieties. These are deficient in gluten, and flour deficient in gluten will not make good bread. With many of the hard varieties the objection, however, is not the want of gluten, but the fact that the miller has not the proper machinery for grinding them. I am glad to say, however, that those days are now passing. Our millers are progressing, like other people, and are purchasing machinery able to cope with the hardest of wheats, and to turn out flour good enough to compete with any in the world. I hope, however, that farmers will not run away with the idea that the days of rust are past. The rust host is round all our fields, the rust is there all the time, and it only requires favourable conditions for development. If we have a cold dry October, we are all right, but give us hot, close, muggy nights, and our wheat will be liable to rust. The wheat plant is like a human being. We all know there are some people who are able to resist certain forms of disease better than others, and in the same manner there are certain varieties of wheat that are constitutionally able to resist the rust disease. We are now breeding these wheats in Queensland, New South Wales, Victoria, and South Australia, and I think we want to be continually breeding them. Wheat is subject to deterioration, and by continual cultivation its constitution is weakened, so that we ought to produce a succession of new strong, healthy varieties able to resist any attack that may come along.

Mr. W. D. LAMB (Yangan): The Belatourka is now better than ever it was, and millers take it readily.

Mr. K. W. SCHOLZ (Stanthorpe) mentioned a number of very interesting facts in connection with rust in wheat, and amongst other things stated that he believed the rust bred among the grass.

Mr. JOHN MAHON (Agricultural College): Mr. Deacon mentions Ward's Prolific, Medeah, and Blount's Lambrigg as really good rust-resisting wheats, but I may say all these were seriously affected at the Agricultural College, Gatton, last season by rust. In fact, we had 38 stud wheats at the College, and they were all damaged by rust with but one exception, and that was a variety known as Crown. I have not had much practical experience with wheat myself in Queensland, but previously to coming to this colony I had been engaged in wheatgrowing on my father's farm in Victoria ever since my boyhood. The best wheat we used to have then was the White Purple Straw, and when I was in Melbourne a few weeks ago I made some inquiries about it. Old farmers told me that this particular variety is still a good rust-resistant kind, and that they are very partial to it. It is a quick grower, a good yielder, ripens quickly, and its straw is quite free from flag. In addition to being rust-resistant, it also shows a non-liability to blight or smut. I have had two bags of this White Purple Straw sent from Melbourne to the College, and I intend experimenting with it myself. As for rye and barley being affected by rust, I may say this is contrary to my experience. At Dookie College they have 600 varieties of wheat growing, not one of which is rust proof, and, for myself, I do not think we are ever likely to get such a wheat. I agree with Mr. Hudson in what he says about the advantages of early sowing and having the wheat eaten down by stock. These two practices, added to growing a quickly-

ripening sort, will, I think, generally give excellent results to the wheat farmer. It may be added that we intend making large experiments in wheat at the College, and hope to be able to give farmers the benefit of our experience.

Mr. J. C. BRÜNNICH (Agricultural Chemist): With regard to Dr. Eriksson's theory mentioned by Mr. Deacon, I may tell you that a mycoplasma is an exceedingly small cell, and it is not to be confused with a bacillus. It is simply a thing without a shape. Dr. Eriksson's theory—which, by the way, I had not before heard of until Mr. Deacon read his paper—is a very important departure from the host theory mentioned by Mr. McLean. In the theory of the host, it is said the rust breeds on some plant in the neighbourhood of the wheat, and it is disseminated and spread if conditions are favourable. In the new theory mentioned by Mr. Deacon, it is stated that the disease is inherent to the wheat, and that with seasons favourable to its development the rust will be produced. I do not wish to express any opinion about this new theory, but it seems strange that if the disease is inherent we have patches here and there in a field which have no rust, while the rest is badly affected, although the whole is under the same conditions. If the disease is in the seed, all the field should be the same. If rust is inherent in the seed, how is it that a healthy crop gives rust one year and the pinched seed does not give rust? Of course it may be attributed to climatic conditions, but it seems strange that certain varieties are freer than others. Do all varieties contain rust or not, or is it simply the more robust kinds that withstand the disease? We ought to be able, by continuous breeding from rust-free wheat, to produce a variety which would not give rust, and if the disease is only in the seed, we should be able to grow a wheat on which it would be impossible to show rust quite independent of variety. Professor Eriksson appears to have made experiments in growing wheat in closed glass cases, with sterilised soil, &c., and this undoubtedly shows that the host theory does not fit in with the experiments. The wheat develops the rust all the same without external influence, and altogether his experiments are most interesting.

Mr. J. PARKE (Tinana) referred to his experiences of wheat culture in the Wide Bay district. He had been able to get varieties, particularly the Early Tuscan, which did splendidly in the district, but the drawback hitherto had been want of machinery, and consequently wheat culture had so far made but little progress about Maryborough. He added that he had tried Purple Straw, but it had been completely destroyed by rust.

Mr. J. C. KENNEDY (Allora): I believe in cultivation for wheat. Plough 8 or 9 inches during the summer, and before you sow the wheat, just scratch the land over so as to allow of the seed being covered. With regard to rust, I may mention that I have obtained splendid crops from pinched seed, and as for early sowing, it should be remembered that there are two or three kinds of wheats. There is a winter wheat and a spring wheat. Sow the winter varieties in April or May, but June is the proper month for the spring wheat. If you plant spring wheat it grows right from the start, and some of the best crops I have ever obtained were sown in July. From the day it was planted till it was harvested it never got a check. It is possible to sow spring wheat too early. It comes up, frost catches it, and it stands withered and yellow. When the spring comes, it gets second growth, and the result is patchy. The eating down of the young wheat by sheep is all right when you have them, but about my district the farmers have no sheep, and were they to put them on to the land, and showery weather to succeed, the black soil would be packed and baked. I do not think feeding down by sheep is a success on the Downs. I have known farmers to borrow sheep and try it, but after the wheat gets a certain height, the sheep do not care about it, and only trample it down. With regard to wet weather, I have had a dry season just until the wheat was getting blue, and then the rust seemed to tackle it. You could see that the wheat was affected, but after 2 or 3 days there came a nice heavy rain, and seemed to wash all the rust off, the wheat ultimately giving a splendid crop. As for the milling difficulty, the millers of course have to make flour out of the

wheat the farmer grows. Some farmers, however, are careless with their wheat and put it up into any form of stack. It gets wet, they thresh it and perhaps spread it out to dry. A sample is brought to a miller, but he will not have it. The farmer grumbles, but he finds a purchaser for it somewhere else, for the farmers in my district do not give much away. As for the hard wheats, the old mills were not able to grind them. I have grown the Belatourka, which is a hard flinty wheat which the old stone mills were not able to grind, but with the present machinery such wheats present no difficulty in grinding. Most of the spring wheats are soft, but I think the Downs farmers have to thank the Department of Agriculture for the number of new varieties they have introduced. As for the Purple Straw, we grew it on the Downs until we almost grew it out of the place. It is a splendid wheat, but you cannot be sure of it. I remember having a paddock of it, only about half a chain of which reached maturity. This half chain was alongside the sliprails by which the horses entered the paddock, and the latter had trodden the ground about it down about as hard as it could be. I have seen oats as rusty as wheat, and barley (malting) the same. I have seen the red rust so thick that you could write your name in it. I have had Steinwedel wheat come on beautifully and reach that stage when you could almost squeeze it; in about 10 days' time it was all spoiled, and instead of a dozen bags per acre, I got 5 bushels of grain like caraway seed. There is no such thing as a rust-proof wheat, but I believe in a man obtaining his seed, whether wheat or any other grain, from another part of the country, say from flat land to hilly. By using the same seed on the same ground year after year the wheat is bound to deteriorate. There was the Allora wheat, one of the finest we ever had, but now as rusty as any. The Budd's Early is now, I think, one of the coming wheats for the Downs.

Mr. W. DEACON (Allora): To show how facts can vary on this wheat question, I have only to instance the case of Purple Straw. What Mr. Kennedy says about Purple Straw is true, and so is what Mr. Mahon says of the same wheat. In the south, however, there is a White Purple Straw, and it does very well there, I understand. Then with regard to practically all of the wheats at Gatton being rusty: Professor Shelton and myself were experimenting with wheats, and had the same varieties at both Warwick and Roma. Some of the wheats that were rusty at Roma were clean at Warwick, and *vice versa*. I believe in early sowing, never mind what kind of wheat it is. If you put in spring wheat early, it will not grow up, but will keep forming roots. There may be different times for harvesting, but there is only one sowing time, and that is in the fall. I believe in the middle of April for sowing all through the Downs, and for the Central district of Queensland, probably earlier still. The seeding time is the same all over the world. As for Belatourka, I recently went to a miller for some of it for seed, but he told me he could not spare any, as he wanted all he had to mix with the softer wheats. The millers take Belatourka and other hard wheats readily now. As for Dr. Eriksson's theory, I hope Mr. Brunnich will try some experiments in the same direction. Eriksson certainly did try the wheats in sterilised soil closed in with glass, so that there could be no infection, and yet his wheats got the rust. With regard to infection, there is rust on certain plants and grasses all over Australia, and I believe the same applies to Sweden.

The HON. J. V. CHATAWAY: I think we must thank Mr. Deacon for his paper. I do not wish to discuss it, but there are two things worth mentioning in connection with it, and one is that we should all realise Mr. Lamb's statement that the wheat industry will never really be on a satisfactory basis until we export. This is true of every industry—that it will never be on a sound footing until it is able to put its produce on the world's market and at the world's prices. Another question crops up: Mr. Mahon was very definite that a certain sort of wheat was a good kind to grow, but it seems to me that it will require a large amount of experience to say that definitely, in one part or another, a certain wheat is the best kind to grow. I do not for a moment pretend to correct Mr. Mahon, but I remember in New South Wales a certain

professor of agriculture was very fond of advocating the Steinwedel wheat. The farmers found in many districts that the wheat was a failure, and other officers of the department were advocating other wheats. The Minister found himself in a quandary. There was no official *pronunciamento* of the position of the department, and the farmers said the department was at sixes and sevens. What he did was this: He called together the officers of the department who were more or less interested in wheat, and having got them to fly at each other's throats, and call each other hard names, he sent them all down to the Experiment Farm at Wagga—that is, the Professor of Agriculture, the principal of the Hawkesbury College, the manager of the experiment farms, and one or two others interested in wheat—and refused to allow them to leave that place until they had arrived at a unanimous report. The thing worked admirably, and they arrived at a unanimous report, dividing the colony into districts regulated by climate and soils. They advised, on behalf of the Department, that such-and-such a wheat was most likely to do best in the southern districts, others on the central plateau, and so on, and it seems to me the Minister behaved with considerable judgment in pulling his Department out of a mess. The next business is, I think, a discussion on the eradication of nut-grass.

NUT-GRASS.

Mr. E. DENMAN (Mackay): Before we discuss this, it would be as well to see if we all agree as to what is nut-grass. We have weeds here known by half a dozen different names in this district. We have canes here known by different names in this district and by other names in other localities. I have here a drawing of nut-grass, taken from the *Australasian*, which will perhaps help us in discussing the matter. There is a small patch of nut-grass on the road running through my land. I simply planted buffalo grass all round it, and I am quite certain that I shall wipe it out. I have done so with *Sida retusa* and other weeds, and I read some years ago that if you planted what we call the Cape Gooseberry, or any other plant of similar dense growth, the nut-grass could not live under its shade.

Mr. J. LOGAN, junr. (Gatton): The only way that I can think of to get rid of nut-grass is to have the ground, when it is fairly wet, well trodden down by stock. Then plough it about 6 times at intervals of about a week. Never harrow or roll, but keep the ground as rough as possible, and in about 6 ploughings, provided the ground is thoroughly dry, you will find little nut-grass left. This is the best remedy I have tried, but it should be done in the hot, dry summer time.

Mr. G. PALK (Loganholme): You may plough nut-grass out and great quantities will die, but the following season you will find it coming up just as thickly as ever. I think it is impossible to get rid of it, but I have found it very good to mix with other things for cows; and I have also found that if you plough it down it makes a very good green manure. I have sown oats on land where this has been done, and have noticed a great improvement in the crop as a result.

Mr. W. GIBSON (Bundaberg): We find the Planet Junior with narrow tines, say, $1\frac{1}{2}$ inches, very useful for keeping nut-grass down. We let it go to the full length of the tine (about 8 inches), and the result is we are not much troubled with nut-grass, although I admit it is almost impossible to kill it altogether. It is true, on a piece of ground, where the nuts have not gone down very deep, we have been able to kill it with molasses. We had a little on a bit of rich soil, and were afraid it would spread, so we poured a few casks of molasses over it and then put some water on the top. It all fermented, and by keeping this going for about a week we destroyed all the nut-grass; and at present this particular piece of land is quite free from it. However, where you can get an implement in amongst the grass and keep it constantly going, I do not think it will do much harm to your crop.

Mr. W. TOFT (Rockhampton): I have never tried molasses, but I can endorse the rest of Mr. Gibson's remarks. I would advise Mr. Denman,

however, not to trust to buffalo grass, and if he has only got a small patch of nut-grass I would strongly urge on him to get every bit of it out, or otherwise it will overrun the whole district.

Mr. P. McLEAN: If Mr. Denman has only a small patch he will be able to kill it by covering it with sheet iron so as to exclude it from air and light. This is on the same principle as Mr. Gibson's molasses. Both are effectual remedies, but of course you can only try them on small patches.

Mr. T. RIDLEY: Ploughing I think will lessen nut-grass to a certain extent, but I do not believe the sun will kill it. It should be burned. I remember a small patch on the South Pine River that has now spread over the whole district, and I would advise anyone if he sees a small patch to dig it up and have it put in the fire.

Mr. C. ATTHOW (Brisbane): Nut-grass was bad at Nundah 35 years ago, and it still exists there to-day. I would warn the gentleman who said that he feeds his cows on nut-grass. The grass is all right and you can kill it, but the nuts are dangerous. Cows will very often get a nut and it will go clean through them. The cow's manure goes on to the farmer's cultivation, and the pest is spread. It takes a good deal of fire to kill the nut, and I doubt whether the sun is able to do this. About Nundah, where the land used to be worth £100 per acre for pineapple-growing, strenuous efforts have been made by farmers to eradicate nut-grass, but generally without avail. The pineapple growers do not consider it a very serious detriment to the crop, however, if it is kept down, but I do not think they will ever get rid of it. A ploughman in the vicinity of nut-grass land should be careful that the plough does not carry the nuts about.

Mr. C. J. BOOKER (Woolooga): I have seen nut-grass eradicated to all intents and purposes by farmers fencing off the nut-grass paddock, and putting into it a run of pigs. I have looked over a paddock where the pigs have been in for a month, and have not seen a green leaf, the field being practically in a state of cultivation. The wire-netting fencing was then pulled up, the pigs turned off, the plough put through the land, and the next crop was as good as from any portion of the field where there had been no nut-grass. At the same time I have seen pigs, with the assistance in their feed of a little milk, top off on nut-grass. If a man who has a patch of nut-grass on his land puts a piece of wire-netting fencing round it, which is pretty cheap, and encloses some pigs, I think he will find the results satisfactory. The pigs for a start cultivate the land themselves, and this, too, on heavy black soil. I remember seeing this done on a farm, and two years afterwards saw on the same land some really good crops. This system is practised on the northern rivers of New South Wales and on some of the rivers of Queensland.

Mr. H. CATTERMULL (Woongarra): In the Woongarra Scrub I have known farmers to have a pigsty made that could be shifted to different parts of a field, and boys, picking up spare nuts, followed the movable pig-pen, but still the nut-grass came up. The same system was tried a second time, but still the pest refused to be eradicated.

Mr. J. PARKE (Tinana): There is a large quantity of nut-grass on the Mary River, and I can quite endorse what Mr. Booker has said. I believe also, in addition to the pigs, that some geese would prove useful aids.

Mr. E. HICKS (Southport): I have followed nut-grass down 4 feet, and I believe it goes down another 4. It is impossible to get it out. Perhaps pigs may be able to take out all the surface roots. I have seen land covered with lantana for 10 years, and when the lantana was removed the land was covered with nut-grass. I would suggest to farmers that a good reward be offered for the best implement that will work among nut-grass, although there is, of course, at present the Planet Junior, but if the various farming associations in the colony combined and offered a good reward, we would perhaps be able to get a better implement for the purpose. Ploughing the land 5 or 6 times is very expensive, and although it is true pigs will eat it, it is only the surface roots.

Mr. BOOKER: The pigs may not eradicate it altogether, but you can still get 2 good crops after the pigs have been on the land.

Mr. F. W. PEEK (Loganholme) : I can testify as to the utter impossibility of our farmers coping with nut-grass ; but I understand there are two kinds, and, possibly, the gentleman who ploughed it out had the smaller kind, which only roots about 4 or 5 inches deep. That kind of nut-grass can easily be got rid of, but on the Logan there are cases where the floods have washed 3 and 4 feet of sand over the original soil, and yet the nuts are still there. It is the pest of every farmer, but perhaps we may be able to find a drench that will kill it. I know Mr. Palk's farm, and I believe he finds vetches and nut-grass make a good cow feed.

Mr. C. F. M. FISCHER (Zillmere) : As for the impossibility of getting rid of nut-grass, I do not think there are many things that are impossible, and I believe we could get rid of nut-grass, bad as it is ; but the question that always comes to the top is, will it pay to get it out ? I believe it can be got rid of just when it starts, and I am quite sure that had I known the dangerous nature of the nut-grass when I first brought out a lot of rubbish to my place, I would not have been cursed with it as I have been for years. I have heard of means of eradication, and I do not think there are any better than those mentioned by Mr. McLean and Mr. Gibson. If we can smother and keep the air out of it for a number of years, we shall at any rate kill it, and if you could only cover it with galvanised iron I believe it would eventually die. I would advise those who meet it for the first time to make every effort to get rid of it, for as long as there is a root left you will still be troubled with it. It is nearly as bad as a cat for lives. I have heard of a nut growing inside a potato, the potato being boiled ; the nut was taken out, it was planted, and it grew.

FIFTH SESSION.

TUESDAY, 27TH JUNE, 1899, 7.30 P.M.

Business was commenced by Mr. G. WILLIAMS, of Runcorn, near Brisbane, reading the following essay on—

THE CULTIVATION OF CITRUS FRUITS. THE CITRUS.

HISTORY AND CHARACTERISTICS.

IN the genus *Citrus* are included several varieties of more or less useful fruits, but it is to the lime, lemon, and orange that principal interest is attached, more particularly to the latter. The orange is said to have been found by the Portuguese upon the east coast of Africa, but it is not known whether it was indigenous there or had been disseminated by the Arabs. When the Portuguese visited India, they found the orange there, and also in China, which was visited for the first time by sea in the early part of the 16th century ; but in whatever way oranges were first introduced into those parts of the world of which they are native, they are now very widely diffused, and are esteemed as being among the most ornamental of trees and delightful of fruits. The species and varieties have also been greatly multiplied, and it is a significant fact that several varieties of the highest order have been added locally since their first introduction to Queensland.

The tree, when full grown, attains the height of about 30 feet, and is graceful in all its parts, the leaves being moderately large, beautifully shaped, and of a fine healthy green colour, shining on the upper sides. The flowers in the sweet orange are of a delicate white, and in the more acid varieties of the family lightly marked with pink. Some plants have more powerful odour than others, and are for the moment more richly scented, but there is a freshness in the aroma of an orange grove that never offends nor clogs.

One great recommendation of the orange is that it may be had fresh in almost every region of the globe, and at almost every season of the year. The toughness of the rind and the aromatic oil with which it is filled, protect it from both extremes of temperature, and when cut from the tree before becoming quite ripe, the fruit will keep for a long time ; indeed the greater portion of the oranges imported into England are cut from the tree when quite green. It is stated that the trees from which the fruit is gathered green, bear plentifully every year, while those upon which the fruit is suffered to ripen afford abundant crops only in alternate years.

According to Dr. Lindley, the orange tribe live to a very great age in a soil and climate that suits them, and even under artificial circumstances there are some wonderful instances of their longevity. The orange tree at the convent of St. Sabina, at Rome, is 31 feet high, and is said to be upwards of 600 years old. At Nice, where the tree may be said to be naturalised, growing quite in the open, there was, according to Risso, a tree which generally bore between 5,000 and 6,000 oranges, and which was quite 50 feet high, with a trunk which required 2 men to embrace it. In Cordova, the noted seat of Moorish grandeur and luxury, in Spain, there are orange trees still remaining which are considered between 600 and 700 years old. The largest orange tree which Mr. Wallace measured in the Azores was 30 feet high, the stem being 7 feet in circumference at the base, but many large trees destroyed by the cocos had been cut down. The productiveness of these trees is almost incredible; props are always used to prevent the weight of the fruit from breaking down the branches. Sufficient time has elapsed since the orange was first introduced into this colony for the development of large trees, but for various reasons few really fine specimens are to be met with.

SELECTING THE ORCHARD SITE.

In order that an orange plantation may be of lasting benefit one of the indispensable conditions is that the site should be free from stagnant water in the soil, and the bedrock should be free and porous so that all superfluous water can at once pass off without injuring the roots of the trees. The surface should be of a free, porous texture, either sandy loam or friable volcanic formation, and the greater the depth the better will the trees withstand seasons of drought. In no case should this class of tree be planted in soil of a retentive or clayey nature, for under such conditions the trees will suffer more or less from excessive moisture, and no system of artificial drainage can have sufficient influence on such soils to render them comparable in any particular with those in which requisite conditions are provided by Nature. Land intended for orchard purposes should be thoroughly cleared and stumped, so that the work of cultivation may be carried on without interruption, and also with the object of preventing an injurious fungus which generates about decaying stumps when left in the ground, causing the destruction of young trees when planted in close proximity.

In the selection of varieties for planting the greatest care should be exercised in choosing only those which have been proved beyond doubt as being vigorous and productive under similar conditions, having due regard to value of product. Too much reliance is often placed on the enticing descriptions invariably given of new varieties, which instead of being improvements on standard kinds are frequently rank failures, or for some reasons quite unprofitable. The Japan Seedless Mandarin, so much in demand a few years since, is a striking instance of the fraud practised on the planter in this direction, and appearances indicate a repetition in some of the late introductions.

GRAFTING ON SUITABLE STOCKS.

It is also of the greatest importance that the trees be grafted on suitable stocks. Grafted trees are frequently referred to as being short-lived, and being ultimately inferior to seedlings, but this comparison is only applicable when inferior stocks have been used. It has been, and unfortunately still is, a common practice to use both the citron and the lemon, and the fact that the grafts take with less than half the trouble, and that the stocks are multiplied almost without effort, is the very sufficient reason from the nurseryman's point of view. The orange on the lemon stock makes most robust growth for the first few years, but soon after commencing to bear fruit a decline is noticeable, and the graft gradually dies back to the junction of the stock. The same applies to the better kinds of lemon when worked on the Bergamot or citron. On the other hand, in budding and grafting on the orange the percentage is frequently very low, and the growth, until thoroughly established, comparatively slow. This disparity in growth arises from the stock supplying the scion with a greater or less amount of nourishment than it would receive from its natural root, and consequently producing a more or less vigorous growth; and, further, if a weak growing variety is worked on a stock that is too vigorous, a strong growth will be induced in the first instance, but in such cases a disparity in the rate of increase in the size of the stem checks the free circulation of the sap at the point of juncture, and the tree ultimately becomes stunted. For permanency the only reliable stock on which to graft is the seedling orange, and where lasting benefit is the object a written guarantee should be demanded from the vendor that no other stock had been used. The growth may not be so robust, but it is lasting, whilst on the lemon the rapidity of growth in early stages only serves to denote that over-luxuriance and consequent weakening of constitution are inseparable. *Citrus trifolata* has been recommended as a stock, but the fact of its being deciduous tends to the conclusion that its permanency is very

doubtful. Possibly it may answer as a stock for the lemon, which in rich volcanic soils dies off before reaching maturity even on self-roots, whilst those on the *trifolata* survive, but it has not been sufficiently tested to warrant its recommendation, and the general principle is that evergreen trees seldom succeed for any length of time on deciduous stocks.

SEEDLINGS *Versus* GRAFTS.

The disparity between seedling and grafted trees is apparent. With the latter the time of fruiting, the quality, and the productiveness can always be reckoned upon, whilst with the seedling everything is in doubt, and the time which generally elapses before it commences to bear is a serious consideration. At Naples a seedling orange was 26 years old before commencing to bloom, and in this colony 16 and even 20 years have been noted; 8 to 16 years are quite frequent. The trees are generally very thorny and of dense growth, and not nearly so easily managed as when grafted.

DISTANCE OF PLANTING.

The citrus may be classed amongst hardy trees, and requires no special system of preparing the soil for the reception of the young trees, nor their after cultivation, but, in planting, care should be taken that they are raised rather above than below the level of the surrounding surface. There is some dispute as to the distance at which the trees should be planted apart, but to allow for full development the round orange and lemon should not be closer than 30 feet. For mandarins a less distance will suffice—25 feet, and for the smaller varieties, as limes, cumquats, &c., 20 feet will be sufficient.

MANURING.

It is a common error to apply heavy dressings of manure about the young trees, particularly at the time of planting, which only serves to harbour fungus and insects without in any way benefiting the tree; and it often happens that the greatest care misdirected in this way has caused large numbers to die off, the deaths being assigned to any reason but the right one. In a poor soil a slight dressing of wood ashes will be found a very good addition, and will in no way injure the roots of the trees. It is after the trees have become established and commenced to bear that systematic manuring is necessary to counteract the continuous strain on the tree. Over-manuring with rank manure has the same effect on trees as excessive watering by irrigation or otherwise. In this case the absorption appears to be too great in proportion to the transpiration; the bark becomes cracked and detached from the wood in different parts of the tree, causing portions of the tree to die right away, the cavities emitting a reddish-coloured gum. Whatever manure is used, it should be applied on the surface about the extremities of the roots, and lightly worked in without breaking or damaging them. So far as the roots have extended the surface should not be stirred deeper than 2 or 3 inches; beyond their radius cultivate deep and frequently. The objects for which the soil is worked are:—Pulverisation to render it more readily penetrated by the roots of plants, and by heat and moisture; to allow superfluous moisture to escape into the subsoil; to deepen the tilth; to add or mix manures; and to free the soil from roots, perennial weeds, stones, or other objects unfavourable to cultivation, and to destroy the surface or annual weeds. The retention of moisture by pulverisation is an important object in working the soil; all properly cultivated soils hold water like a sponge, while in untilled soils the rains either never penetrate the surface, or they sink into the subsoil, and are either lost or retained by it, and prove injurious.

PRUNING.

As a rule, the trees are more inclined to be too crowded than too thin in and about their centres. This must be guarded against by pruning, or sunshine and air cannot get the admission and circulation necessary for ripening both wood and fruit and preserving productiveness. A crowded tree, in addition to being more susceptible to disease, is less readily freed from it. Pruning is generally performed during winter, and the extent to which it may with advantage be practised depends very much on the subject under treatment, its rate of growth, and many other local circumstances. As different soils and localities have their own particular influence over the trees grown in them, so does the proper system of treatment vary somewhat in detail. Although severe pruning is not to be recommended, it is essential that the system should be moderately practised, and the work conducted with a view of preserving equality and symmetry amongst the branches, also at the same time promoting vigour and fertility. Young trees are invariably disposed to produce more branches than space can be provided for, and by thinning out those that are weak and misplaced additional nourishment is supplied to the others, which, of course, are more favourable to fruit-production than if developed under a system which involves frequent amputation.

The head of the tree should be kept well balanced, and the branches trained as near to the ground as is consistent with the various operations of cultivation. Trees so trained are not nearly so liable to suffer from the effects of high winds as those with long, bare stems, and are much more convenient to treat when affected with disease.

INJURIOUS INSECTS AND DISEASES.

The greatest obstacle in the way of successful cultivation of citrus trees is the number of injurious insects to which they are all subject, and which are now so thoroughly diffused throughout the colony that their complete eradication may well be looked upon in the light of an impossibility; but by close attention they may be kept in check, and orchards maintained clean and healthy. The present method of treating affected fruits for destroying the insects with which they are infested may present recommendations to some minds, but the most sanguine would hardly advance it as being efficient against the spread of disease, and must admit that it is inferior to a system whereby the trees are kept clear of disease, thus removing the occasion for the treatment of their product. The subject of treatment of the diseases is thus summarised by Lodeman:—"All applications against insects should be applied when they will do the most good. Every delay is of advantage to the parasite. The trees are in need of the application, and the grower should be in a position to modify his treatment so as to make it conform with the character of the insect or with the disease which is being treated. Every year and every day such knowledge will be of value; so many things are still unknown, and so many points still in dispute, that personal knowledge and judgment about individual cases are not only desirable but very essential. It is scarcely necessary to enter into details respecting the benefit derived from the proper application of insecticides and fungicides. The question, Does spraying pay? can best be answered by the grower, and he must be his own judge regarding the advisability of treatment. Let the question be considered from a proper standpoint, and the matter will be simplified. The final test in regard to the making of treatments may be stated in this form: Does the difference between the market value of sound fruit and the value of the product obtained when no treatments are made warrant the expense of purchasing materials and the labour of making the applications? The grower knows the price received for his crop; he also knows the price paid for perfect or fancy crops; the difference between the two, so far as injury from insects and fungi are concerned, shows to what extent the crop may be benefited by treatments. It is then a simple matter to determine if the applications will pay. It will be noted that little question regarding the efficiency of the applications is here entertained. It is taken for granted, and with good reason, that proper treatment must produce the desired result. There probably exists an economical remedy for every disease affecting plants; the vast majority of these diseases are now under control, and although a few obstinate cases still exist, the future is encouraging when we consider the progress made in the past."

The same conditions necessary for the successful cultivation of the orange are essential for all citrus fruits, and similar treatment is necessary to insure their success.

DISCUSSION.

Mr. J. PARKE (Tinana): I suppose the orange does as well about Maryborough as in any other locality in Queensland, and the majority of growers there now have the impression that seedlings suit the soil better than worked trees. For my own part, I first of all tried a number of worked trees which originally came from Sydney, but after I had cultivated and attended to them for 4 or 5 years they turned out unsatisfactory, so I got rid of them, and it was a number of years before I tried orange-growing again. Seeing some of my neighbours, however, successful with seedlings, I followed suit, and I am happy to say my trees are now doing well. Where a good deal of error is made in orange culture is in planting too closely, more particularly with seedlings. The seedling, as a rule, grows very robust and large, and requires ample room. Provided the soil is suitable, they want to be planted from 30 to 35 feet apart, although, if the soil is poor and hungry, 20 feet apart is sufficient. In the Maryborough district, however, we do not plant on poor soil more than we can help. The greatest drawback to orange-growing is the insect and fungus pests. There are the injurious scales, over which we have spent a considerable amount of time, and although we are not likely to eradicate them altogether, still, I am happy to say, we are able to hold them in check. Some time ago, through the kindness of the Agricultural Department, we had Messrs.

Benson and Voller in the district, who did a great amount of good among the orange orchards. At Melrose, a lot of cyaniding was done, and I am told it has been a great success, the scale, thanks to the fumigation, having seemingly all perished. Mr. Benson tells us that the cost of this fumigation is about 1s. 6d. per tree, with an extra 3d. per tree to go as a sinking fund towards the tents, &c.; and I believe a good many in my district will avail themselves of the cyaniding process if they can get it done at that price. The difficulty, however, arises in connection with the procuring of the necessary fumigating plant. Such a plant would cost from £70 to £80, and few orange-growers would be prepared to pay that amount. What has been suggested is that, as the Department has already the appliances all ready to use, it should lend them out to growers, who, I think, would be only too pleased to pay a price for their use and avail themselves of an opportunity to rid their orchards of the plague altogether. As an alternative, it has been suggested that if the Government were good enough to assist the orange-grower to something like the same extent as the canegrower, by subsidising £1 for £1 his efforts at scale destruction, growers would combine and go in for a plant. Seeing, however, that the Government has already a plant, I think the former suggestion would be preferable.

Mr. W. TOFT (Rockhampton): There is one point in the seedlings *v.* grafts discussion that struck me, and that is the number of years a seedling takes before it bears fruit. I would be glad to know if anyone has ever experimented in the direction of taking the young seedlings out of the ground during the first few years of their growth, and giving them a thorough root pruning in order to make the trees bear earlier. From 8 to 16 years is a long time to wait, and I think excessive root-pruning might have the effect of making them fruit earlier.

Mr. C. J. BOOKER (Woolooga), in reply to a question, said that on the Burnett River, at Walla Station, there were 40-year-old orange-trees still in regular bearing.

Mr. T. RIDLEY: I have had seedling oranges bear from the sixth and seventh year, and at the eighth they generally give a good crop. As for the cyaniding process, Mr. Benson was at my place about 4 months ago and treated a number of trees. The fruit was small at the time, and the orange-trees were covered with white and wax scale. The fruit is now ripe, and I must say the cyaniding process cleaned the trees thoroughly. I do not think any scale was left alive. I find now, however, the scale is coming back, but I suppose other trees, mangoes especially, gave it to them, and altogether I think the cyaniding process would have to be carried out every 6 months. I think 1s. 6d. a tree must be for the material alone that is used in the cyaniding, for I think, if we want an outfit and the 5 men it takes to work it, that it cannot be done at that price. The process is certainly very efficacious, but there is the question whether it will pay or not.

Mr. J. E. NOAKES (Maryborough): I was down a short time ago at Mr. Smith's orchard at the Burrum, and he bore testimony to the efficacy of the cyanide treatment. On the trees which were not fumigated the fruit is black, but on the treated trees the oranges are perfectly green and clean. Mr. Smith is so pleased with the results so far that he intends to get a plant and do his own cyaniding, and he calculates the cost at 5s. a tree. All his trees are seedlings, and he is about the largest grower in the district. I expect he will have about 2,500 cases this season.

Mr. W. THOMPSON (Childers): I grow a few oranges for amusement, and although I am told the Isis Scrub is too dry to grow any fruit at all, yet I think I have some of the finest orange-trees in Queensland. I blunder along with them; but, anyhow, they have come to perfection, and this season I have had to use a ladder to get at the fruit—and splendid fruit it is. Coming up on the s.s. "Barcoo," one of the stewards gave me an orange. I asked him where he got it from, and he told me Bowen. Well, it was a fearful watery thing, without any flavour; and the oranges from the Burrum are the same. I consider there is no flavour in either the Bowen or Burrum orange; and if a man

wants an orange, he wants one with flavour—that is to say, a fruit that is worth eating. I was once at the Bunya Scrub, and asked a man at the hotel whether the district would grow oranges. "Yes," he said, "to perfection. Splendid oranges grow here." I tried a few, and they were simply awful. If you want to do anything in the way of orange-growing, get a really good grafted tree, or a seedling from the gentleman who has just read the paper. I have bought pounds and pounds' worth of trees that, when planted, seemed to grow down, and would apparently take 20 years to reach any height. These are the trees you get from travelling tree merchants. I agree that a tree from a seedling is the best, but I think a seedling will bear within 7 or 8 years. You do not get much fruit the first couple of years, but, still, enough to repay you. For scale I have taken some kerosene, put it in an old dish, and painted the tree where the scale was, with the result that it disappeared. That is very simple and cheap, and anyone can do it. You must cultivate your soil for oranges, but do it lightly. Do not cut the roots. Keep the land clean. Orange-trees die out soon if not taken care of.

Mr. G. TURNER (Bowen): With regard to what Mr. Thompson said about Bowen oranges, I may say that I have brought a case down with me to show you that we can grow oranges there. [Mr. Turner then distributed a case of mandarins among the delegates.] One of our growers, Mr. Hildebrandt, was prevented from attending this Conference by the fact that he was just planting out 700 trees. He has 3,000 trees, and he expects to ship 2,000 cases this season. Altogether we shall ship from Bowen 10,000 cases within the next month or two. He tells me he has a good deal of trouble with scale, but he simply takes a bar of soap and melts it in water. He then adds two bottles of kerosene, and works the whole up into an emulsion. He then mixes this emulsion with four kerosene tins full of water, and sprays it over the trees. This spraying and the careful pruning of the trees are the greatest secrets of successful orange-growing.

Mr. F. W. PEEK (Loganholme): I am an orange-grower, and part of my district, Mount Cotton, is noted for its oranges, and after Mr. Turner's practical demonstration, I must say that the Bowen oranges compare very favourably with ours. A good deal may be said on the question of seedling *v.* grafts, but in our district I think it has been proved that the seedling is the best. A great deal of injury has been done in the past by nurserymen selling inferior trees to would-be growers; and I think, if nurserymen, when selling citrus plants, were compelled to give a guarantee that what they were selling was true to name, it would do away with a good deal of these petty failures of grafted oranges on bitter stocks or on citrus plants of other varieties. As an evidence of the superior flavour of seedling fruit, I may instance the case of the Beauty of Glen Retreat, which is the finest mandarin we have, and which is practically a seedling. In the orchard of Shailer Bros., in my district, which is splendidly looked after, until the trees begin to bear, peas, beans, turnips, carrots, &c., are between them, which makes the land remunerative until such time as the fruit shows itself, but as soon as this occurs, all other crops are removed from the ground. They then, however, do not neglect the cultivation of the soil, and in addition they drain and sub-drain. Drainage is one of the main secrets in the successful culture of citrus fruits. Shailer Bros. are constantly going into town with wagon-loads of fruit, the flavour of which compares favourably with that of Bowen. Coming back to the graft question, I think there is no doubt but that the graft partakes to a certain extent of the flavour of what it has been grafted upon. I remember purchasing 100 trees, said to be mandarins, from a nurseryman, and waited 7 years for them to bear. Unfortunately they had been grafted on bitter stocks, and although the fruit was juicy and sweet it had a bitter flavour which was left behind in the mouth. I must endorse the opinion that has been expressed, that the seedling is the longer liver, the more robust, and the better tree for the all-round grower.

Mr. C. ATTHOW (Brisbane): Although a middleman, I have been on the land, have done as much cultivation as most, and have always had a great love

for horticulture, but my present position as a dealer probably gives me many advantages over the ordinary grower for gaining information in connection with the fruit industry. The other day a person came to me and asked if there was any demand for cumquats, or whether I could dispose of lemon juice, and I had to reply in the negative in both cases. This man had several hundreds of trees of both lemons and cumquats, and practically half his life had been wasted, because he had not the knowledge at the time he planted his orchard to know what fruit was marketable. Worked trees do not appear to stand nearly as well as seedlings, and if a man put all his money solely into worked trees, perhaps at the end of 7 or 8 years he would find that he had nothing. A Maryborough man told me that as the worked trees bear more quickly than the seedlings, he plants the two alternately in his orchard, and so when the worked trees are dying out, he has an orchard of seedlings just coming into full bearing. I have found that a seedling from a really first-class grafted orange appears to be the best, and I would not advise anyone, unless he cannot help it, to plant from a seedling a second time. Although many may differ with me, I must say that lemons have not been successful in Queensland. You may get a good case or two, but our lemons generally run to thick skins, and a good many of the trees at times die. Perhaps we may be able to get over this, and it would be a good thing if we could, for there is a big market for lemons in Queensland. As for soils, it is said the citrus tribe must not be planted on a clay soil; but I know a person who has acres and acres of oranges on such a soil—that is, a clay subsoil 8 inches below the surface. It is “stringy-bark” land, and yet it is a fact that he gets good crops. Perhaps it is because he irrigates his land. In the paper it was said that oranges could be cut green, and although I do not believe this has been attempted here, yet it is done in Italy, and the fruit keeps for months. If they could be cut green in the middle of winter, before the appearance of the fly, it would be a great advantage to growers, and moreover the fruit could doubtless be kept right up to Christmas. As for cyaniding, I have been informed by a Mount Cotton grower that this process has been a great success with him.

Mr. GEO. WILLIAMS (Runcorn): Root-pruning will slightly affect trees, but I do not think to the extent of inducing early maturity. It is, however, difficult to say that a tree would have borne earlier if it had been root-pruned, or *vice versa*, because you cannot test the same tree for both systems—namely, with or without. At the same time it is a practice of some to half ringbark a branch on which it is desired to produce fruit, and this is done with the Washington navel orange, which is a shy bearer. As for seedlings, I have a tree 20 years old which has never borne fruit, and Mr. Norris here tells me he has trees 8 years old which have not yet fruited. There are, on the other hand, worked trees on the Blackall Range, 5 years old, which have been yielding 30s. a tree for the past 2 years. The tendency with all cultivated fruits is to deteriorate rather than to improve, and that is the reason why the majority of seedlings are inferior to the grafted trees. Of course, with improvement in cultivation you get improvement in the trees, and the way to perpetuate that improvement is to get worked trees. As for worked trees not living long, I know of worked trees older than myself, grafted on orange stocks, which are still healthy and bearing, while those grafted on lemon stocks frequently die back after 7 or 8 years. They sucker from the bottom, and are absolutely worthless. The product from the best varieties of grafted trees will always command the best price in the English market, and I think I am safe in saying the best fruit is generally obtained from grafted trees. As for diseases, I have not had much experience of cyaniding, but the use of kerosene and soap will keep scale pests in check. Nearly all our indigenous trees harbour these scale insects, and you want to continually attend to your fruit trees, as I do not think it possible to eradicate the pest altogether. If cyaniding would rid the trees of the scale altogether, doubtless the process would be most beneficial. As for the stock affecting the scion, as mentioned by Mr. Peek, I have never heard of that before. Mr. Peek has made the

discovery, but I do not think it is known to horticulturists, nor have I ever seen any reference to it in any literature. The stock might perhaps affect the tree, but I do not think it would influence the quality of the fruit, except perhaps in the case of an extra vigorous tree, when a coarser fruit would result.

The Hon. J. V. CHATAWAY: I think we must thank Mr. Williams for his paper. Grafted trees appear to have few friends among the speakers here to-night, but I imagine that for all that, many professional orchardists, or most of them, will prefer them, for many reasons, to seedling trees. With seedlings there is not the certainty of date when they will bear, nor is there a certainty as to the fruit they will produce. It is true that many of our farmers, not authorities in the purchasing of worked trees from the southern colonies, have been most unfortunate with grafted stock. There have been people, seeking whom they may devour, going about among farmers, advertising themselves as the agents of nurserymen. In reality, however, neither they nor their principal, if they had any, were nurserymen, but were simply swindlers who bought up stocks grafted on anything, or half grafted, and sold them to farmers, with specious promises, throughout the length and breadth of this land. What Mr. Peek has called the petty failures that have occurred in fruitgrowing through this cause, I call myself a great disaster to those who would have taken up fruitgrowing in a small way in this colony. We hope to be able to see our local nurserymen of Queensland able and willing to push these harpies out of the land, and that the Government is giving them all the assistance they can in the matter they know perfectly well. The Government cannot sell their stock for them, but if once they make thoroughly known what has been going on, and what nearly every farmer in the colony now has experienced, I am sure that the locally-grafted trees true to name and on proper stocks will find the sale they deserve. With regard to fumigation: One gentleman suggested the Government should provide a plant and the orchardists should pay for the fumigation at so much a tree, or else that the Government should endow any group of farmers or fruitgrowers who were anxious to purchase a cyaniding plant—endow them as has been done in the case of other pests, such as the flying fox and cane grub. In Cape Colony, the last of these two methods is the one pursued, and the Government have an open offer to orchardists to endow them £1 for £1 towards the purchase of a plant for the eradication of scale insects and similar pests. Here we propose to take another course—namely, the first one I have mentioned. After a long series of experiments which have been carried out, and which I may say have all been debited to the Redland Bay Experiment Orchard, which came in for a good deal of criticism when the last Estimates were on, we have now got to know the proper tents, the correct proportions, and the best methods by which to work this fumigating process as economically as possible. By those experiments we have got to know the strength of the cyanide, whether the trees should be dry or damp, and the various other circumstances under which it is best to apply the fumigation. Cyanide is an extremely dangerous article to handle, except to an expert man or to one used to dealing with poisons, and we propose to keep one or two cyanide plants going, under expert direction, for fumigating trees for orchardists who believe in the process. The lowest cost per tree will be 4d., and for a big tree up to something like 1s. 9d. or 2s. That is not all. We shall supply the labour of 3 men. We shall supply 3 experts, but shall expect the orchardists to furnish the labour of 2 more men, and to help us so that we will not be put to the expense of carting the plant from one orchard to another. We have already started among a group of farmers in the vicinity of Redland Bay, where they have had more opportunity perhaps of seeing the effect of the cyaniding process, and have consequently a greater belief in it than exists in some other districts. At the Wellington Point Show, last week, we exhibited samples of oranges and lemons from trees in an orchard which had been much infested with red scale. These trees had been cyanided on the 24th February, the fruit then being just formed. The oranges from the cyanided trees were almost perfect, and fit to go into any competition; whereas the fruit from non-cyanided trees,

in the same orchard, were covered with scale and of no size. It was the same with lemons. It was not that the fruit was so much cleaner, but the cyanding had had the effect of almost doubling the size of the fruit as compared with that from non-treated trees. I am told, moreover, that the growth of the cyanided trees shows a really remarkable improvement over the others.

MR. WILLIAM GIBSON, of Bingera, Bundaberg, then read the following paper on—

DRAINAGE.

Though proper drainage of the soil is a subject of the highest importance to all classes of agriculturists, I have some fear of wearying you in this attempt to put clearly before you the result of a draining experience that dates from over 30 years ago.

Together with my father and brothers, I first settled on the land at Doughboy Creek, a place not very far from Brisbane. We were not long there before we found out that it would be necessary to adopt some means to get the water away from the land if we wanted payable crops. The undertaking, as it presented itself to us at the time, was too great for individual enterprise to cope with successfully; but something had to be done. There were other settlers in the district beside ourselves, so a meeting was called, and the result of that meeting was that 15 of us, all settlers, agreed to co-operate in digging a main drain 12 feet wide, to a depth of from 3 feet to 6 feet, over a distance of about $2\frac{1}{2}$ miles, from the Brisbane River, following an old watercourse up through the farms of the people interested. The beneficial effect of this first venture in drainage was so plainly to be seen, that some of the settlers of their own free will came and helped to make another drain from Doughboy Creek for a distance of a mile or so. This latter extension was for the purpose of drying our roads by way of surface drainage, as the roads for the most part led through swamps, and in places were so boggy as to be well nigh impassable during wet weather.

Our early operations were confined to surface draining, that is to say, the excess of moisture was removed by means of open drains, the lands being ridged up for a width from 12 feet to 24 feet with a good water furrow between. This system worked fairly well, but, as you all no doubt well know, the water furrows are not always clean when rain comes, and in our case it was often necessary to go out and clean the furrows in the rain to save the crops from being destroyed.

So it came about, that this question presented itself before us: Could we not put in a system of under-drains that would provide a constant "get-away" for the surface water when rain fell, and so do away with the labour involved in maintaining the efficiency of open drainage?

Drain pipes or tiles were quite out of the question. As a substitute, however, we resolved to use slabs. We began by digging drains, using a steel spade for the first draw (this was all soil), then we took a grafting spade (bottoming tool some call it) to dig out the bottom, which consisted mostly of blue clay. These drains were dug from 18 to 24 inches deep, and finished off at the bottom to a width of 6 inches. Slabs were then split and dressed to a uniform width of 8 inches in lengths of from 3 to 6 feet and distributed along the banks of the drains; a man then entered the drain; and taking a slab from the edge of the bank set it edgewise along the bottom of the drain, on the left-hand side, and allowed it to fall over and lean against the right-hand side of the drain, thus forming a triangular or V-shaped opening. This was continued till the entire length of the drain was completed; care being taken that the squared ends were well shouldered close up to one another and formed close joints. After the slabs were thus laid, saplings, when handy, were laid along the back of the slabs right to the end of the drain to promote increased discharge of water; the work was then covered in with a layer of grass or cane trash, and the drain filled in with clay first and then soil.

Where you have a stiff clayey subsoil, such a drain will last for over a quarter of a century, and render efficient service all the time if kept open at the outlet. The cost of a drain of this type complete may be set down at 5s. per chain. Only the other day I saw one of these drains, and it was then working well and maintaining a discharge of water that was flowing as freely as when I first constructed it some 20 odd years ago. Our first experiments having proved so successful, such like drains were continued there right on until my firm sold the plantation.

A somewhat different system of under-drains has been adopted on Bingera, though, in the first instance, slab drains, as I have just described them, were used. Some fourteen years ago, when I first saw Bingera, I thought—"Here is a place that will not require to be under-drained!" Bingera has an undulating surface with plenty of fall, and at that time was a dense scrub. In due course the land was cleared and planted, and all passed off well for about four years. After that springs

began to break out on different parts of the plantation. In one patch alone over 10 acres died out altogether, and in other cases where there had been good crops of "Plant" and "1st Ratoon" the next "Ratoons" were far from satisfactory. Under such circumstances, it was evident that some scheme of drainage would have to be adopted here also.

My first experiment on Bingera was (as I have said before) with slab drains. On the 10-acre block I put in 15 drains, at a distance of 45 feet apart; the land was then worked up into good condition, and afterwards planted with good healthy plants. The result exceeded our most sanguine expectations, and was, in fact, quite a surprise to us. It turned out a splendid block of cane, and we became convinced that it would pay to drain all the wet lands. But as we were committing ourselves to a scheme of drainage on a scale of much greater magnitude than had been practised hitherto, we thought it would be preferable to use drain pipes instead of wood. We called for tenders for tiles to be made on the plantation. The contract was let to two men who thoroughly understood the work; we erected the necessary machinery, and a system of drainage was initiated that is being constantly added to as circumstances suggest; and that in return has succeeded in coaxing from the soil an increased yield of crop with each following year.

I have here a sketch plan of the estate, which shows that drainage on Bingera has been worked out on a scheme as complete as possible. The arrangement of the connecting main drains has been the subject of much thought. Many minor (but none the less important) details, too numerous to mention just now, varying much according to the nature of the soil and the contour of the land, have to be taken into consideration in determining the direction, distance apart, depth, and fall of the smaller branch drains that flow into the larger mains. The tendency of the tiles in loamy soils to become choked up with silt has to be guarded against. The size of the tile to be employed depends in a very great measure on the work required of it. In such matters circumstances very materially alter cases. Tile-draining is costly work and requires close supervision. A golden rule is to avoid undue outlay without impairing the efficiency of the scheme.

The worst laid tile in a drain is the standard of that drain's capacity for work, therefore it must be apparent to all what extreme necessity there is for close and rigid inspection of every single tile laid before the drainer is allowed to fill in the drain. Whilst personally supervising the work on Bingera, I employed a surveyor to peg out the drains, check the levels, and map out the work as completed. A faithful record of the work done is necessary for reference when making repairs or additions, so as to save time and labour.

On Bingera Plantation the main open drains are put down at a depth of from 3 to 4 feet at a distance of 20 chains apart. The tile drains are put down at a depth of from 2 to 3 feet. Where practicable, they are set out at right angles to the main drains, and where possible are so laid as to discharge from the centre both ways into open mains at either end.

The tiles are distributed over the field at a cost of 6d. per chain. They are dropped along the drain from a dray.

The cost of draining on Bingera, where we have red volcanic soil, is as follows:—

For 2-inch Tiles (at per chain).

| | £ | s. | d. |
|--|---|----|----|
| Digging 2 feet 6 inches deep | 0 | 2 | 6 |
| Grading, laying, and filling-in | 0 | 1 | 0 |
| Carting and distributing tiles along drain ... | 0 | 0 | 6 |
| Cost of tiles | 0 | 3 | 0 |
| Total | 0 | 7 | 0 |

For the 3-inch Tiles.

All items are the same as for the 2-inch, except the extra price of the tiles.

For the 4-inch Tiles.

Digging to a depth of 3 feet is 3s. per chain.

For 6-inch Tiles.

Digging is 3s. 6d. per chain.

The laying and filling-in of the 4-inch and 6-inch tiles costs very little more than for the 2-inch or 3-inch tiles. We have given up making tiles on the plantation for some time now, our present supplies being drawn from Bundaberg, the price being satisfactory.

The Bundaberg prices are as follow :—

| | | | | £ | s. | d. |
|----------------------------|-----|-----|-----|----|----|----|
| 2-inch tiles, at per 1,000 | ... | ... | ... | 2 | 5 | 0 |
| 3-inch " " | ... | ... | ... | 3 | 8 | 0 |
| 4-inch " " | ... | ... | ... | 6 | 0 | 0 |
| 6-inch " " | ... | ... | ... | 10 | 0 | 0 |

Striking an average over a broad area, about 12 chains of tile drains go to the acre, at a cost of nearly 8s. per chain, or a fraction under £5 per acre. This includes cost of supervision, &c. In looking at these figures you will see that draining is a costly undertaking, and it is not to be wondered that so little has been done on the agricultural lands of Queensland. The area underdrained with tiles at Bingera is 850 acres.

I will now mention some of the reasons why land should be drained preferably with tiles.

There is much land that has an excessive amount of moisture. It remains cold and wet for weeks, and even months, and ridge it up in any way you please it will still remain wet and cold. Now, often there is much time wasted on land of this sort, and not only so, but only too often a small harvest is the return for the labour that has been expended on the ground.

Now, I know for a fact that ground of this kind can be cured by under-draining, and the crops very much increased, with a less amount of labour thereafter. I have had that class of land to deal with on Bingera, and with such treatment it is now giving a return equal to that on any other part of the plantation.

A second great advantage of tile draining is that the water furrows are done away with, making the land more convenient to work and reducing the cost of weeding very considerably, as anyone with a practical knowledge of working land will readily admit.

A third important reason for tile draining is that the land is always in a more convenient way for the removal of the crop; particularly is this the case with sugar-cane.

The fourth is perhaps a more important reason than any of the preceding: It is that in Queensland our best growing season is during the months of January, February, and March. During these 3 months the rainfall is usually very great. Our crops on undrained land suffer very much at times by these heavy rains filling up the space in the soil previously occupied by air. Now, this condition is highly unfavourable to the growth of such a crop as sugar-cane. It is necessary, then, that the excess of moisture be removed as soon as possible, otherwise the surplus water in the soil will very soon check the growth of the cane, and we all know that the growth of the cane should not be allowed to stop at that time of the year.

In tiled drained ground the water in the soil is speedily reduced, only a sufficiency of water being left in the soil calculated to promote the healthy growth of the crop, and for its maintenance from one rainfall to another, thereby insuring a luxuriant growth and a consequent increase in the weight of the crop. There is also a marked increase in the quality of the juice. Our chemist has analyses of cane grown on drained land from 16 per cent. to as high as 21 per cent., and on undrained land adjoining, and other conditions being identical, the analyses have only ranged from 12 per cent. to 15 per cent. These figures alone are proof enough of the advantages of effective tile drainage.

I do not know of anything more that I can say to add weight to the few remarks I have just made. Like myself, most present here are interested in agriculture in a practical way, and what I have contributed at this session is as much for the purpose of suggesting inquiry as for affording information. I will conclude my address by expressing a hope that what I have just said may in some way be of service to the farming community.

At the conclusion of his paper, Mr. GIBSON referred to the difficulty he and his neighbours at Doughboy Creek had in the early days with a settler who possessed the creek frontage, and who refused to allow the drain to follow its natural course into the creek through his property. Every effort was made to obtain permission from this settler, but without avail, and the drain had ultimately to find its way into the creek by a long and expensive detour. Mr. Gibson considered there should be a Drainage Act in force in the colony by which individuals of this nature would not be allowed to stand in the way of their neighbours carrying out necessary drainage works.

Mr. A. WATT, of the Agricultural College, Gatton, then read the following on—

SUB-DRAINAGE.

Having read two papers on the importance of sub-draining on two previous occasions—the last being at the Conference held two years ago at the Queensland Agricultural College—and finding a journal containing the reading in the College library, it struck me as being unnecessary to repeat it. I have it here, and should delegates wish to have it read I shall do so. If not, I will pass on to a little practical experience I have had since then in reclaiming a swamp. A year and ten months ago I was sent to Dunwich to examine and report on the possibility of draining a swamp of some 80 or more acres. I found it a vast accumulation of vegetable and peaty matter, that had been growing and decaying for ages, and growing a variety of aquatic plants. I tested for bottom in various places, and found that the mass rested on sand similar to the sand on the beach; which satisfied me that the sea had at one time ebbed and flowed over it, and that the sand, or old sea-bed, should be my guide for bottom. I reported favourably, and was asked to carry out the scheme in accordance with my report. In sub-draining, you must have a firm bed for the pipes, otherwise they will get pressed out of position and choke the drain. A considerable portion of the swamp lay low and level. In the low parts I could bottom on the sand in 3 feet; in other parts I had to go down 5 and 6 feet to reach the sand; but it had to be done, as there was nothing firm enough between the surface and the sand on which to bed the pipes; and even on the sand we met with short stretches of quicksand, which gave trouble, and would require timber to carry the pipes. In draining, the first thing to be done is to find the lowest ground, and through that open your main leader. The laterals, or minor drains, are then marked off, when you have decided upon their width apart. Should the land all slope one way, one leader will be sufficient, if the length of the laterals is not too great—say, over 200 yards; in such case, a sub-leader in an oblique direction should be put in across them. In this instance I required two main leaders on to the beach, and sub-leaders off these according to the lay of the ground. I should mention that, in draining such land as I have described, it is not advisable to lay the pipes and fill in at once, as all spongy or peaty soils shrink and subside when drained, and it may happen that the drains will require deepening. In this instance the subsidence was from 6 inches in the shallow to 14 inches in the deeper drains in a few months. Land that would not carry a calf became sound enough to carry horses. Another important reason why such drains should not be filled at once: the land is sour, and the more it is exposed to the action of the atmosphere the sooner it will sweeten. It can hardly be expected that such land would become immediately productive, it being heavily charged with ulmic acid. To cure that, an application of caustic lime is necessary; it acts directly upon vegetable matter after draining (lime is simply wasted on undrained land). Had I been left to finish the draining, and prepare the land for cultivation, I would have applied from 75 to 150 bushels lime per acre—say, $2\frac{1}{2}$ to 5 tons, at 30 bushels to the ton. From 75 to 240 bushels may be considered average quantities from the lightest to the heaviest soils. Lime has been applied to the land in the old countries for a very long period of years; the object has always been the same—to increase the crops by stimulating the soil. If ploughed in, it has no immediate effect, but if simply harrowed or scarified in, it has effect at once. “Oyster middens” are found at intervals along the shores of the island containing large quantities of decomposed shells, which—in the event of lime being too costly—could be applied with good effect (not to be compared to lime, of course) as they would combine with the light peaty soil and fix it. After dealing with the most difficult portion of the swamp, I left for Emerald Downs and the work stopped, to the great disappointment of the Medical Superintendent, who took a keen interest in it.

Mr. WATT also concluded his paper by endorsing the remarks of Mr. Gibson relative to the necessity for legislation to deal with individuals who refused to allow drains to pass through their properties.

Mr. J. PARKE (Tinana): Some land that I had been cultivating for a number of years was of a red volcanic nature—originally forest land, but it used to give me considerable trouble at times. About Christmas, or before, a very heavy thunderstorm would come down. At this time my crop of corn or potatoes would be looking splendid, but when the hot sun came out after the rain the whole crop would be spoiled within the course of a couple of days. I started then to open some drains, much against the advice of my neighbours, I may add, and at first I used stones for the drains, for on the other side of the

road, at Neardie, they had drains similar to those mentioned by Mr. Gibson, but in the course of events the drains got blocked, and I did not adopt that system. I therefore used stones, but only small ones, employing nothing beyond a 3 to 4 inch gauge at the outside. As a result, I saw an improvement in the land, but stones becoming scarce, I started using timber, and a great quantity of my drains were made from stringy bark, a timber which the Government seems to ignore, but which I consider one of the best we have. It is durable and easily worked, good in the ground and good out of it, and I may add, by the way, that I have had stringy bark shingles last for 29 years. Where you can get good splitting timber I consider it a good substitute for stones. I had the timber in from 4 to 5 feet lengths, laid one along each side and placed a slab on the top, the drain being from 12 to 14 inches wide at the bottom, and a dressing was thrown in at the joints, but we took every precaution to have the slabs as closely jointed as possible. These drains worked admirably. I have tried pipes, and I must say they make a good drain, but an expensive one. For a main drain I use a 6-inch pipe, which means 6d. a foot for the pipes alone; for the other drains leading to the main I put down 4-inch pipes, and further back I used 3-inch. I would not use anything smaller than 3-inch, for the saving is trifling, and a 2-inch pipe gets very easily blocked. Before my land was drained it was 9 or 10 days after rain before I could put a horse on to it, but since draining I find that within 2 or 3 days after rain I can get on to my land and work it. You can tell by a glance at a field where the land has been drained and where not, by simply looking at the crops. All my land is now drained with the exception of some 2 acres, and these will be done as soon as I have time.

Mr. E. DENMAN (Mackay): All the gentlemen who have spoken on drainage have mentioned the fact that pipes are apt to be silted up, but I would like to ask, Is it not customary in using draining pipes, to break the pitch from a lower to a quicker flow with the view of preventing their silting up?

Mr. GIBSON (Bundaberg): I believe it is done where drainage is carried on on a scientific scale, but where you get sufficient fall I do not think there is any necessity for it. A good flow will clear the pipes all right.

Mr. T. RIDLEY: I was one who stood shoulder to shoulder with Mr. Gibson in the early drainage schemes at Doughboy Creek, but it was not my first experience in draining, as I had had a good deal to do with it in the old country. Mr. Gibson alludes to the necessity of a Drainage Act, and although I understand there is something in the present Divisional Boards Act with reference to drainage, yet I believe it has been found unworkable, and so I hope when the new Divisional Boards Bill is introduced into the House there will be provision made so that one farmer shall not be allowed to stop drains from following their natural course. I can endorse what Mr. Gibson has said with regard to the difficulty we had with a couple of farmers on the Doughboy Creek and Brisbane River frontages, who refused to allow the district drains to follow their natural courses through their properties.

Mr. W. BEALE (Childers): When drainage was first mooted in the Isis Scrub, the cry went forth that it would never be any good, because there was no water about the place. I remember a boring plant being introduced into the district and going down through 70 or 80 feet of red volcanic soil, without the slightest change being seen in its character all the way down. However, after clearing the scrub, springs began to appear all round us. I then bought some of this rich land and started sugar-growing, but the first obstacle I met with was the wet that the farmers in the district had been crying for. I found any number of springs from time to time, so I immediately set to work to find out what elevation I had, in order to see if I could thoroughly run the water off the land. I soon started drainage operations, but having no pipes I made use of the hardwood scrub about the place. In cutting my drains, I found a large quantity of bluish stone. These I picked out carefully, and found they were nearly all wedge-shaped. Those stones I used for drains, putting the sharp edge down, with a few small stones on the top to carry the soil when it was being cemented

into a roof. In that way I completed about a mile of drainage. I have also used pipes, but I find that where there is a great declivity in the land, say, over 1 in 100, in very heavy weather there is a danger of the pipes bursting, and the whole of the soil washing away. To get over this, put in a sufficiently large pipe for the main, and also see that your exit is clear of silt. In the event of the mouth of the drain becoming choked, your system will become useless. Having completed all your drains, the advantages that are likely to be gained are great. Land that requires drainage is invariably of a very rich nature, but undoubtedly it is sour if not drained. Drainage adds to the weight of the crops, and as for cane, it increases the percentage of sugar. Without drainage after rain, while you are waiting for a fortnight or a month for the water to percolate into its natural course, your horses are idle, and your weeds are growing rapidly, with the result that when you come to scarify your land you find it almost impossible. If the land is drained, on the other hand, you can get on to it within 2 days after the rain ceases, work it thoroughly, and have it in a certain state of tilth without any fear of weeds; and these remarks apply to land for English potatoes and other crops as well as for cane. I am pleased to say that all my drainage schemes have hitherto been a success, and in not one single instance have any of them worked badly.

MR. H. CATTERMULL (Woongarra): A drainage system that has been found to work admirably in the Woongarra Scrub is to put in pipes, put rubble on the top of the pipes to the extent of from 6 inches to 1 foot, then trash on the top of that and fill up.

MR. C. F. M. FISCHER (Zillmere): Many of you have doubtless heard of the pineapple disease which appeared in the Nundah district, and which affected us very severely just after the 1890 flood. Pines began to die off in a very mysterious way, and drainage was tried as a remedy, I being about the first to adopt it. Pineapples are chiefly confined to the ridges, which are of a sandy nature with a sandstone bottom, and consequently it was thought that drainage was entirely out of the question. However, we found that when there was a great fall of rain, peaches and other soft fruits suffered equally with the pines, and we made an attempt at drainage to see if water was really the cause of the disease. In trying to save my pines I tried several drainage systems, and amongst these bush drains made with tea-tree. Eventually I went in for tiles, 2 and 3 inch chiefly, and they have worked admirably. Although the initial expense of buying the pipes may be severe, they make the cheapest drains in the long run. They have been in my ground a good number of years now, and work as well as ever they did. If there is any rainfall at all you can see them spouting out the water at a great rate, and the result is you can get on to the land very soon after the rain ceases. On the heavy land we used to find we could not go near it for a number of days, but now after a heavy rainfall you can start working it almost immediately the rain stops. I am sorry to say that, as far as stopping the pineapple disease was concerned, the drains were not a success, but for all that I do not know of anyone who regrets the money expended on this work, for there is not the slightest doubt that it has greatly improved the land for agriculture generally.

MR. E. HICKS (Southport): In the matter of slab drains I think the best way is to have them V-shaped. As for the individual who will not allow a drain to cross his property, I think most of us have been troubled with that man, but still there is often some excuse for farmers living on a river bank who act in this way. I have seen, in the 1893 flood especially, drains in a man's farm turned into creeks, and this sometimes occurs about the Nerang River. The drains, however, should be carried into the back creeks, and this would not be so likely to occur. The clause in the Divisional Boards Act is very good as far as it goes, but that is not too far. It is hardly necessary to speak of the importance of drainage, and I am sure there are no farmers in Queensland who can farm properly unless they do drain. If a man cannot get pipes, splendid drains may be made from slabs, and for this purpose bloodwood is an excellent timber.

Mr. J. CROOK (Rockhampton) testified as to the efficiency of drainage, especially in connection with orange culture.

Mr. W. CLAYTON (North Isis): In the old country, when draining on low land where there was no fall, we used to make a small dam at the end of the drain, say an inch, and take that inch out to the other end. If there was no fall, the pressure of the water when it rained coming on to the water in the dam would force it down. On sandy land, or land which was very porous, we used to put the drains a chain apart, but on clayey stony land, half a chain apart, and at a depth of about $3\frac{1}{2}$ feet. Mr. Gibson's estimate of the cost of drainage appears rather high, for in the old country I have known thousands of drains put down at 1s. 8d. per chain, from $3\frac{1}{2}$ to 4 feet deep. The contractor had to cut out and fill in for that money, and a man would earn from 3s. 6d. to 4s. a day at that price. The land was a strong clay, and the men used to work in gangs, but there was a special man to lay the pipes, and I may add that to do draining work properly you want a special set of tools.

Mr. W. THOMPSON (Childers): When the question of drainage crops up in connection with the Divisional Boards Bill that I understand is to be again brought before Parliament, I hope it will be remembered that Divisional Boards are the biggest aggressors in the matter of turning water on to people's land. I happen to be on a Divisional Board, and know they do turn water on to land, with the result that the owner has no alternative but to put down drains. Not far from where I live, the water comes down a hill, and the Divisional Board turns it into the main road, or practically into a man's land, which is only a foot or so off the road, and I think some proviso ought to be made in the Act to allow of some sort of compensation being made for this kind of thing, say, in the direction of the Divisional Board having to pay something towards the cost of the main drain which the owner of the land is forced to put down.

Mr. K. W. SCHOLZ (Stanthorpe) also endorsed the remarks that had been made in favour of drainage; also instancing the fact that very good drains could be made out of bricks laid on their side.

Mr. W. GIBSON (Bundaberg): With regard to the price of my drains which Mr. Clayton thinks was rather high, I may say that was the contract price, and the men earned a fair wage. There is, however, a great difference in digging drains on a clay soil and on a ridgy one. In some of the ridges I referred to, the workman had to use the pick, and, altogether, I think the price was reasonable.

Mr. A. WATT (Agricultural College): As for the cost of draining, in the East Lothians of Scotland it used to cost from £3 10s. to £7 per acre. I have known it cost £7 10s. per acre, but of course the whole thing depends upon the distance the drains are placed apart. Drains placed 15 feet apart would cost the latter figure. As for the improvement to the land, it is probably up to 50 per cent. With regard to what Mr. Denman said, there is no occasion for any fall in drains, although, of course, when you are going over a heavy slope you can hardly avoid a fall, but in any event there is not much danger in any silting in connection with pipes. A proper fall for a drain is about 8 feet to a mile.

The Hon. J. V. CHATAWAY: Perhaps the most startling fact made in connection with this interesting discussion on drainage is the one made by Mr. Gibson, who pointed out the enormous increase, amounting to over 30 per cent., of the sugar content of cane grown on drained land. It did not altogether surprise me, for his brother, the Hon. Angus Gibson, was telling me the other day that he had made an offer to any of his farmers who were under contract to him to pay 6d. a ton more than the contract price for cane if they had drains in their land. With reference to the Drainage Act that is asked for, there are two matters really in connection with it: One thing is already provided for—namely, the method of getting means to carry out drainage works; and the other, the right of any individual farmer to drain on to his neighbour's land. Nobody has ever been able to tell me really what is the law on that point, and in every district there are some who are troubled to know whether they can float water

on their neighbour's property—that is, on through to the natural watercourse. With the view of arriving at further information on this and other points, I move that the two drainage papers read this evening be referred to the Resolutions Committee.

Mr. Chataway's motion was carried, and the Conference then adjourned at 10:30 p.m.

SIXTH SESSION.

WEDNESDAY, 28TH JUNE, 1899, 9:30 A.M.

Business was commenced by Mr. J. E. NOAKES (Maryborough) moving that a hearty vote of thanks be passed to the School of Arts Entertainment Club for the performance they had given to delegates on Monday evening, and for granting delegates the use of their card and chess rooms. The motion was seconded by Mr. F. G. JONES (Biggenden), and carried with acclamation.

In reply to a couple of questions originating out of his paper on the previous evening, Mr. G. WILLIAMS (Runcorn) stated that the reason why a custard-apple mentioned by a delegate would not bear was probably owing to its being planted in an unsuitable locality. The best way of perpetuating a plant was by grafting. Seedlings were very capricious, and were often unproductive.

Captain HENRY then asked when the subject of Federation was to be discussed; and, in reply, the CHAIRMAN stated that the following morning (Thursday) would be devoted exclusively to Federation and sugar.

RESOLUTION.

DRAINAGE.

The following motion from the Resolutions Committee was then moved by Mr. F. W. PEEK, and seconded by Mr. J. E. NOAKES:—

We, the Resolutions Committee, having in view the great benefits derived by drainage and sub-drainage, as advocated in the papers read by Messrs. Gibson and Watt, and the difficulties in the way of having such schemes carried into effect through not having a Drainage Act, would suggest that it is desirable that the Government take such measures to give effect to the wishes of this Conference in the matter by passing such an Act.—*Carried.*

Mr. P. McLEAN then read the following paper by W. R. Robinson, Toowoomba:—

THE DEVELOPMENT OF THE PIG INDUSTRY.

I much regret that I am not with you to-day. I fully intended to be, and looked forward to this Conference with pleasure. Mr. McLean has very kindly undertaken to have my paper read for me; and should any gentleman desire further information on the subject, I shall at all times be only too pleased to give him all I can.

Following up my paper on pigs and their management read at Gatton Conference, and "Bacon and pigs, and how to breed them," read at Rockhampton last year, I now will endeavour to give you some idea of the expansion and development of the pig industry.

This important and rapidly improving industry now promises to be one of the most remunerative in Southern Queensland, combined as it must be with dairying and farming, where these industries are carried on to any very great extent. The Darling Downs is now rapidly being put under the plough, and 20 cows are milked where a very short time ago there was only 1, and our friend, the pig, has naturally made his appearance in large numbers, and is daily helping to turn in the dollars to the farmer.

As the dairy industry increases, so must the pig industry thrive, because there is no more suitable food for young and growing pigs than the refuse from the dairy.

We have only to look back a very few years and see the class of hams and bacon that were put on the market, in many cases unfit for food, utterly unmarketable, and a source of trouble to the storekeeper who took the risk of buying it at any price, and a loss to the farmer, who in many cases fed his pigs for 10 or 12 months.

All this is now changed, and the farmers owe their thanks to the men of enterprise and pluck that have started up-to-date factories, and are now putting pork products on the market in the very best form—men who have spent thousands of pounds in working up a market, and men who have spared neither time or money in giving the farmers an improved class of pig.

Compare the pig of to-day to what it was a few years ago. Farmers who are paying attention to careful breeding and grading their pigs now have an animal that with ordinary care is fit for the bacon factory at 5 to 7 months old.

I am sorry to have to say that many farmers are still under the impression that half the breeding goes down the throat. This is a great mistake, and the sooner they try it in a practical way the sooner will they be enlightened.

The well-bred, shapely, deep-sided, full-hamned pig is worth 50 per cent. more than the common, coarse-boned, slab-sided, thin-hamned, long-snouted brute you see so many men wasting good food with. Not so long ago we thought 50 to 60 pigs at a sale a big day's yarding. To-day it is not an uncommon thing to see 500 to 600 pigs sold and delivered in a day, with competition keen for them; and within 12 months, I venture to say that in Toowoomba alone you will see 1,000 pigs sold at one sale.

The industry is making rapid strides; it has come to stay, and by careful management it promises to be one of the largest, if not the largest, and most profitable industry in this the garden of Australia.

Of course when I say "in this" I mean the Darling Downs, but at the same time I think that in the near future you will see the North play a very important part in this growing industry. It has been argued by some who have evidently not taken the trouble to look into the matter carefully that federation will kill this industry, but the following figures are worth looking over. They give plain facts:—

Queensland exported bacon in—

| | | | | lb. | | £ |
|------|-----|-----|-----|---------|-----|--------|
| 1896 | ... | ... | ... | 155,000 | ... | 3,882 |
| 1897 | ... | ... | ... | 680,321 | ... | 17,929 |
| 1898 | ... | ... | ... | 811,961 | ... | 21,917 |

Queensland exported hams in—

| | | | | | | |
|------|-----|-----|-----|---------|-----|-------|
| 1896 | ... | ... | ... | 86,562 | ... | 3,020 |
| 1897 | ... | ... | ... | 189,530 | ... | 6,450 |
| 1898 | ... | ... | ... | 327,242 | ... | 8,511 |

and live pigs to the tune of £2,718; making, in all, the very handsome sum of £33,146; the whole of this being taken by the sister colonies.

We have at the present time in the colony about 128,000 pigs, and during 1898 the number killed at the factories alone was 85,510, producing 6,973,007 lb. of hams and bacon.

This industry has not been bounty fed, neither has it asked support from the Government. Throughout the colonies the public are daily learning to consume more pork products, and why? Simply because they are getting them put before them in a better form, and more tastily got up.

In America the consumption of pork products is something enormous, to say nothing of their export trade, that in the year 1883 exceeded all others (excepting wheat and cotton) amounting to £21,000,000. Now, if America can do this enormous business, surely we Australians should be able to capture some portion of so profitable a trade. We have our chilling establishments, fast lines of ocean-going steamers carrying cargoes of frozen products, and markets within easy reach of our shores.

The Cape should be a fairly remunerative market, as I notice that a shipment of cattle from our ports realised £32 per head. There should be room for a few shipments of pork there.

Shipments of hams and bacon are regularly being made to Western Australia, Tasmania, Batavia, and to all our Northern ports. These are not pork-producing areas, and not likely to be, as the climatic conditions are not suitable. Therefore, there is every prospect of the industry forging ahead. There is also room, even in our own town, for a fresh pork and small goods trade.

The demand is good for well-got-up, marketable goods. There is no place here where one can buy a decent joint of pork, pork sausages, pork pies, and other porcine dainties. These things only require putting before the people in an appetising form, and there would be no scarcity of customers. Owing to there being no fresh-pork trade here, porkers are not a profitable class of pig for our farmers, as they must either sell them as forward stores to their neighbours or keep them until fit for the bacon-curer, and this may not always be convenient when feed is short.

The Price.—This is the all-important point to the farmer and pig-raiser. Well, pigs are like any other marketable commodity, they fluctuate in value according to supply and demand.

During the past 12 months farmers have been receiving a top price for their pigs, and in many cases, owing to their being fed on soft food, there has been a great shrinkage in the cured products; consequently loss of weight and loss to the bacon curer. Grain-fed pigs are always worth more than milk and slop-fed pigs, and if the past season had given a good maize crop pigs would have been considerably cheaper, but, at the same time, would have paid the farmer as well.

Take America. With their enormous grain crop, they get on an average 27s. 6d. to 30s. for prime baconers—which means a pig not less than 180 to 200 lb.; whereas here we have been getting 38s. and up to 45s. for pigs ranging from only 120 to 150 lb., clearly showing that the American farmer prefers selling his cheap grain products in the form of live pork, and, being a pretty wide-awake gentleman, knows which pays him best.

Now, with our favourable climate, cheap lands, and everything in our favour, we should, in the near future, be a formidable competitor. At present the Sydney market may be said to control the Australian markets, as most of the southern colonies buy largely there, and Sydney buys largely from here, both in a live and cured form.

I have been trying to induce southern buyers to operate here, but lately there has been no margin of profit to them, our prices being equal, and in some cases better than theirs. May, June, and July generally show a fall in prices, owing to the rush of fat pigs, in consequence of maize and pumpkin crops being harvested.

Marketing.—The present system of selling pigs will, I think, very soon be on a better footing. The old idea of selling to any pig-buyer who chooses to go round to the sties and make an offer is by no means a good one. They must make their average prices come out right, consequently one man gets the value of his pig, and the other man much less. You don't see woolgrowers selling their produce in this fashion; they submit their products to public competition, and get market value for them.

I maintain that all fat pigs should be sold by auction, and by live weight, not by appearance, and I hope ere long to see this system in vogue. A weighbridge at the various markets could easily be erected, and let every lot of pigs be weighed, their weight posted above their pens, and sold at per lb. live weight. Buyers would then know exactly what they were buying, and the farmers would be more satisfied; the grain-fed animal would give his owner a good idea whether it would pay him to grain feed or not. This matter of weighing might well be taken in hand by the Government. Let them erect weighbridges at the various trucking yards where pig sales are held, and charge a small fee, of say, 2d per head as a yard due. It would pay them well to consider this matter, as the business would be a remunerative one.

I would also suggest that a qualified inspector attend all sales, and condemn any animal he considered unfit for food.

A Pig Breeders' Association would be of great value to farmers and others, as there are many little matters that often crop up that require seeing to. Take, for instance, the trucking conveniences at the various railway trucking yards. They are utterly unsuitable to load a truck of pigs from, the present race and conveniences being enough to kill a man, to say nothing about the bruising and injuries the unfortunate pig receives.

The shelter and watering conveniences are about as bad as they can be. An association might do a great deal to remedy these existing evils, and materially assist in building up one of the leading industries in Southern Queensland.

The next paper was by Mr. E. N. ROGERS, of Port Curtis road, Rockhampton:—

PROPOSED DAIRY LEGISLATION.

The object of this paper is to criticise a Bill "to provide for the registration and inspection of dairies and to regulate the manufacture, sale, and export of dairy produce," cited as "The Dairy Produce Act of 1898." The Bill was introduced into Parliament, referred to a select committee, and their report was printed. The Bill proposes to lay down rules, to be fixed by a Government department, as to the minute details of dairy management, and to enforce these rules by means of Government inspectors with enormous powers of interference and the right to inflict heavy penalties. And there is to be no appeal except to the Minister, in a colony of 668,497 square miles. There is no board of dairymen, and the Minister, whose qualifications are unknown, and a few experts have power not only to administer a most stringent Act, but to legislate without consulting Parliament by means of undefined regulations. The Bill had a bad time of it in committee, but the committee did not finish its work, and

the Bill was shelved. But, as both the experts and the public still ask for stringent legislation, another attempt is likely to be made soon to pass this or a similar measure. As the Bill concerns dairymen and farmers directly, this Conference seemed a good opportunity of bringing the matter up, especially as the present Ministry is not committed to or responsible for the measure. The aim of the Bill must meet with general sympathy, since it is to protect the public health and to secure a better quality of dairy produce for export. But this very fact makes it all the more necessary to criticise. Unpopular measures meet with plenty of opposition, and are therefore framed carefully. Popular measures have not to face the same criticism, and are framed and passed often without due consideration, especially when they affect a class like dairymen and farmers, the nature of whose occupation makes it difficult for them to organise and influence public opinion and parliamentary debate. The popular aim is generally right, but the popular methods of attaining the end in question are generally wrong, for the average man, unaware or heedless of the complex nature of society, likes to take the direct royal road. And this is what the Dairy Act proposes to do: Instead of trying to reform the dairyman gradually by education, instead of teaching him and persuading him to co-operate, its method is direct compulsion. The local authorities have been very lax in sanitary matters for many years, although Acts are in existence—the Public Health Act, the Food and Drugs Act, the Stock Diseases Act—which, had they been enforced, would have made this Dairy Act unnecessary. Local control and local inspection have proved failures, so we are to jump to the opposite extreme of complete centralisation, although common sense ought to tell us that if local control has failed because the local authorities are too much interested, central control is certain to fail for the opposite reason—that the central authorities are too little interested. Here, as everywhere, the true legislator should try to hit the middle way. A judicious mixture of compulsion and persuasion is what has to be provided for. Local control is weak because little can be done which people object to, and central control is harsh because everything is done or attempted without consulting or getting the consent of the people of the locality where the Act is administered. It is surely easy to combine the two by having a local board or council to advise a single head appointed by and responsible to the central authority. But this Dairy Act provides for nothing of the sort. The district inspectors not having any local body to advise them will have to receive all instructions from headquarters: instructions which are sure to be unsuitable to many localities. It is the class of small dairymen and selectors which will suffer under this Act, for the big factories can always take care of themselves. With ample capital to pay for first-class management and improved machinery, the Dairy Act will not affect them directly—in fact, the big factories approve of the Act because it saves them trouble and expense in inspecting the sources of their milk supply and educating their suppliers in habits of cleanliness and improved methods. They complain, as it is, that one careless or ignorant supplier may contaminate the milk supplied by all others. They have in some cases offered more for aerated milk, but dairymen have neglected to purchase and use aerators even then. Naturally the big factories welcome an Act which makes aeration compulsory, and supplies inspectors at other people's expense who can give the factory managers a hint as to any impure source of milk supply. But a Minister settled in Brisbane, and a board of experts, are not at all likely to realise the difficulties a small farmer has to contend with—the want of capital, the extreme difficulty of getting suitable labour, the manual drudgery of which leaves him no energy or time to think how he can improve things. And if the provisions of the Act are strictly enforced, the small dairymen and farmers who do not make dairying a principal feature are certain either to give up the business, as they have actually threatened to do in some places, or to be compelled to get into debt and eventually ruined in order to comply with the requirements of the Act. Then the big factories, in order to keep up their milk supply, will have to take over the selections themselves or to employ their late owners on wages. If the Government finds funds for the factories and creameries, the end of it is likely to be State socialism, while the independent yeoman farmers will be gradually wiped out. Labour members in Parliament approve of Acts like this precisely on this ground. It is a step towards socialism, they say. And "socialism in our time" is in Parliament now, which looks like business. Individualism and socialism are both extremes to be avoided. I look rather to co-operation as the "golden mean," and think that we shall eventually realise in Australia a true co-operative Commonwealth. But I do not think we are ripe for this yet, and must for the present be content with individual ownership of capital and machinery and profit-sharing with employers. These preliminary remarks may seem superfluous, but they are not really so, for unless the legislator understands the tendency of society—what the society for which he makes laws is becoming—legislation is a leap in the dark. If we are going to trust to pure individual

enterprise in dairying, the system of inspectorship is evil and unnecessary. If we are going to have State socialism, the inspectors and experts instead of inspecting ought to actually do the work, manage it, and oversee it. If we are going in for profit-sharing as a step towards true co-operation, then the business of the Government is to legislate with a view to this, to educate dairymen for co-operation when Government interference would cease altogether except with the industry as a whole, and to legislate, if necessary, so as to compel the private owners of factories to take those who supply them to some extent into partnership by means of profit-sharing. When we turn to the Act we find that does none of these things. It retains private enterprise while it gives to inspectors and experts such extensive powers of interference as to amount to a proof that private enterprise has completely failed. It does not allow the experts and inspectors to become fixed and actually do or manage the business. And it is legislation rather in the interest of private companies and against the interests of small dairymen. It is a piece of legislation guided by no definite principle, and likely to prove unsatisfactory to everyone who is affected by it. A proof of its purely experimental power conferred on the Governor in Council—practically the Minister and expert—to make regulations which on mere publication in the *Gazette* have full force of law. Regulations may be thus made with regard to the powers and duties of experts, analysts, and officers; the registration of dairies, brands, marks, &c., of owners and consigners; dairy ventilation and drainage; the situation of water-closets; the keeping of swine and the construction and situation of pigsties; the inspection, cleansing, and disinfecting of dairies, utensils, machinery, works, carriages, and everything in connection with dairy produce; the use and treatment of stock diseased or suspected to be diseased; the application of tests—e.g., tuberculosis; the preparation and manufacture of milled butter; the disposal of condemned dairy produce; the aeration and cooling of dairy produce; the use of preservative and colouring matters; notices to be given under the Act; payment and recovery of expenses; imposition and collection of fees; the qualifications of experts, inspectors, officers, and—as if this long list was not enough—all other matters and things necessary for the efficient administration of the Act; and a breach of regulations entails a penalty of not more than £50. Now, when everything is controlled from one centre, as under this Act, uniformity makes administration much easier. There is a probability, then, that the department will prescribe definite methods of doing everything; it certainly will have the power. We may be compelled to erect dairies and pigsties on one plan, have one style of cart, one sort of cooler and aerator, and one description of machinery. This would entirely destroy individual initiative and remove the incentive to improvement. An inspector might come along and say—“This new process and machinery of yours is not that prescribed by the Minister. I cannot allow you to make butter in this way; I shall be in danger of losing my billet if I do not stop you.” Suppose the Department prescribes a definite plan for a chilling-room and a particular kind of refrigerating machinery. The use, say, of liquified air, might at any moment make the whole thing obsolete. Suppose the Government lent money to dairymen for machinery and works, and suppose the experts knew of a cheaper method of production, the inertia of the Government would have to be overcome, money voted in Parliament, and all the rest of it, before an improvement can be made. Meanwhile individual enterprise in some other countries, not hampered by Government interference, would drive our products out of the market. To come to the powers and duties of inspectors under the Act, an inspector may at all reasonable hours enter and inspect all dairies, examine all utensils, machinery, works, carriages, store-houses, and ships used in connection with dairy produce; and, if he thinks fit, by order in writing under his hand, order the cleansing and disinfecting of everything or anything; forbid the use of anything and the removal of any produce for such time as he thinks necessary. And a dairy, it must be remembered, is defined as any place where dairy cows or other animals are depastured or kept, or where dairy produce is stored, manufactured, or sold or exposed for sale. Under definition, an inspector might enter any private premises or paddocks. Any old woman with a goat might under the Act be ordered to stop milking and clean her billy-can. An inspector may demand samples of dairy produce or water for analysis. An inspector may at any time open any keg or a box or vessel which contains, or is suspected to contain, dairy produce. Thus a dairyman in a hurry might lose a train, or have his cart stopped anywhere at any time because an inspector, who might have a down upon him, suspected a box to contain dairy produce. If any inspector thinks any stock are diseased, he may exercise the powers conferred under the stringent Stock Diseases Act of 1895, or by undefined regulations, or by the provisions of the Dairy Act, which requires owners to isolate diseased stock, to keep their produce separate, and to discontinue the use of it as food for man or for any other animal. An inspector may order the water supply to be discontinued and a pure supply found; and after reference to the Health Officer of

the district, may order the removal or its isolation of any farm or a dairy farm affected with disease which might contaminate dairy produce. And in the schedule of the Act there are 18 diseases mentioned—8 in human beings, 10 in stock. Any produce may be condemned and disposed of as the Department thinks fit, and no produce which has been in contact with or even near diseased persons or stock shall be sold or exposed for sale, or by clause 14 the produce of stock even suspected of having ulcers or running sores, &c., is not to be sold. Sour milk is prohibited from sale, though the manager of the Silverwood factory said, before the select committee, "If sour milk is prohibited from sale it will spoil a good deal of the trade; we dispose of a great deal of sour milk to bakers for bread-making, and it is generally regarded as wholesome." Then in future no one is to be allowed to sell by measure, and no one is to be allowed to adulterate dairy produce with animal, mineral, or vegetable oils, or extraneous butter fat, though good cheese can be made from skim milk in this way. Then the inspector can demand from the owner a list of his customers. Plainly this is a power which should only be used in extreme cases under order from the Health Officer. Again, the fact that diseases have existed upon a dairy for one day is to be *prima facie* evidence that the owner knew of it, and neglect to give notice of it makes the owner liable to £100 penalty or six months' imprisonment. Manifestly, owners to be safe would have to treat their hands like niggers on African diamond-fields, and strip them naked once a week at least. The penalty just mentioned can be inflicted upon anyone who obstructs an inspector or expert, or refuses to give any information or to obey the order of an inspector, or refuses to give any notice prescribed by the Act or Regulations. For thorough-going inspection this Act can hardly be beaten, but is it not also a *reductio ad absurdum* of the system itself? And I think that those who have had experience of inspection in Central Queensland, during the late tick scare, will agree with Dr. Bancroft, Health Officer for Brisbane in 1897, when he said before the select committee, "To give the inspector power to sit down here would be a terrible thing." Of course, he said, "If you got an angelic form of inspector, well and good," or "an angelic form of dairymen," his examiner added. Now, if such a system of inspection were carried out, it would create a despotism tempered probably by the occasional examination of an inspector, especially as, if the experts had their way, they would eradicate disease by the compulsory destruction of all diseased animals, and the Acts say nothing about compensation. To give such powers is too much for average human nature. Inspectors are not likely to be angels or devils, but very average men. In fact they must be "Jack of all Trades" men. To properly carry out his duties, as the select committee pointed out, an inspector would have to be a sanitary expert, a veterinary surgeon, a medical man, an analyst, and a butter-taster all in one. And when we consider the independent class of men he would have to deal with, he would have to possess infinite tact and perfect firmness. In a somewhat similar case in New South Wales the Colonial Secretary of that colony said that not more than three such competent men could be found in the colony. In New Zealand they have had to import veterinary surgeons. If the inspectors exercised their power they would demoralise dairying and themselves, and to give them powers which they cannot possibly use is also to demoralise both. Then think of the expense. By section 18 of the Regulations it would appear that the industry itself is to bear the expense. Could a not too profitable industry stand such a system if it was properly carried out, and if the public is protected, why should it not share the expense? Dr. Bancroft thought it would take five inspectors doing nothing else to properly inspect the dairies within a radius of 10 miles of the centre of Brisbane. How much we must discount the opinion of dairy experts in matters like this may be seen from statements made before the select committee by one well-known expert who said he thought the Bill entirely reasonable, and that he failed to find any unworkable clause in it. Asked how many inspectors would be required under the Bill to overtake the whole colony, he said, "I think it would take half-a-dozen." Half-a-dozen for a colony of 668,497 square miles! And yet when this expert was asked further on if new model by-laws issued by the Central Board of Health, which cover much the same ground as the Dairy Act, were enforced, would it not meet the case, he said, "No." Asked why, he replied, "You want a man to keep travelling through the country in the various districts to witness the cows being milked; to be on the ground almost every other day. To be there periodically, at any rate, to see what is being done." Anyone can see from this what the inspector once begun would develop into. We should have an inspector sitting on the cap of half the milking-yards of Queensland. The poor dairyman would be taxed by a mild, yet despotic, Government to pay an army of inspectors, and to cap it all would have to feed them with his own milk and whisky to keep them in good humour. And the inspector would probably carry rifles to "spot" stock diseased or suspected to be

diseased. Some of the companies in New South Wales, the expert above referred to said, appoint their own inspectors. In the South Coast at the present time (November, 1897) there is a creamery inspector who, to my knowledge, killed 35 per cent. of one man's dairy herd which were subject to tuberculosis. It is to be hoped that the company compensate him. It would be entirely unjust for our Government to start destruction in a hurry, after years of laxity, without compensation. In the *Agricultural Journal* of October, 1898, an account is given from American journals of an attempt to stamp out tuberculosis in Massachusetts by Act of Parliament. At first half value was given for cattle destroyed, and then full value, as farmers objected. Out of 210,000 head 9,844 were suspected for tuberculosis, and only half of these reacted. Thus, only 2·4 per cent. of the cattle inspected proved to be diseased. To weed out 2,500 badly diseased cattle in four years 10,000 slightly affected had to be slaughtered. The whole business cost about £140,000. The cattle killed were worth £6 17s. 6d. apiece: half their value was expended in condemning them. Altogether the cost of the whole work amounted to £20 a head. Four out of every five killed were but slightly diseased, might have recovered, or were available as healthy meat. The whole business was condemned as being a system too utterly unscientific, too horribly extravagant, too senseless and impractical to be ever repeated. One paper speaking of this positive failure of the radical method, said, "Lastly, in all these years the milk or beef from a tuberculous cow has never been positively proven to have been the direct cause of consumption in a single human being. The danger which exists has been grossly exaggerated, as shown by the widespread decrease in consumption coincident with a large increase in the per capita use of milk. American experience ought to show the impossibility and absurdity of applying the radical method to Queensland which in 1894 had 7,012,997 head of cattle, now about 5,571,292. We must go slowly." The eradication of tuberculosis in stud herds is badly wanted but not only in Queensland. Southern importations and English are largely responsible for our large percentage here. And to stamp out tuberculosis altogether we should have to stamp out many human lives. There is a great deal of gross exaggeration about the dangers from milk and bacteria and impure water. Experts differ about the absorbing power of milk with the animal heat in it: typhoid in the Kangaroo Point case was never traced to the milk; the laxness of the municipal authorities seems to have been largely responsible for that outbreak. Mr. Grimes told the select committee that he saw cows which supplied Adelaide with milk grazing in paddocks over which the city sewage, not deprived of faecal matter, had flowed a fortnight before, and was told that the matter had been thoroughly tested, and that there was no danger of spreading disease from allowing milkers to graze there. From the committee's report it would appear that typhoid germs are conjectural. There is a good deal of conjectural legislation in this Dairy Act; for example, those angelic and all-wise inspectors are required to administer it if it is not to be a farce. Mr. Mahon, on cross-examination, candidly admitted that the inspectors required were things of the imagination—that he had never met in actual life a single man who had all the necessary qualifications. I have not the slightest idea who drafted this Bill, but it seems to me a piece of ideal legislation—ideal in the sense that it places perfect trust in experts and inspectors; and ideal also in the sense that it perfectly distrusts the poor dairyman for whose benefit some say it is intended. I cannot close this paper without a few brief suggestions. The origin of many existing evils in Queensland is improper centralisation; the locking up of lands by absolute ownership; the indebtedness of selectors; the want of proper labour, and cheap reliable money. We want to catch the farmers' sons and daughters young, and give them proper instruction in cleanliness and improved methods in agricultural schools scattered over the country, not too expensive for poor men. Instead of using inspector-force, we should utilise public opinion. If an expert had the right of entering all dairies, which should be registered, he could report to his local chief, who, at his discretion, could, after warning, publish in the local press or agricultural journal the names of owners whose dairies were improperly conducted. The Government could do much to improve the industry and the breeds of stock without using compulsion at all. We want all the science and expert advice we have, and more, but to allow scientific men to dictate, to allow them to administer and to make their part of the Government machine, must be bad for experts, bad for the public, and bad for science itself. I must express my admiration for the splendid work our Agricultural Department is doing, and say that I hope it will not mar its usefulness by trying to do things it is not fitted to do.

To conclude with a paper on Scandinavian dairying from Sir Edmund Verney's pen:—"The Scandinavian farmers, who are steadily under-selling us in our English markets, find that a high standard of cleanliness pays. The cattle enjoy better health, and the dairy produce commands a higher price. They, therefore, band themselves

together for co-operative dairying; they keep their cow-houses and piggeries as clean as drawing-rooms, and their cows are groomed like racehorses. Every man or woman who enters a cow-house or dairy must be clothed from head to foot in clean white clothing; they must wash their hands before milking, and observe all other precautions. In every town or considerable village the agricultural chemist is found actively and continually at work; water, milk, artificial manures, and seeds are carefully reported on; produce of all kinds is scientifically watched and experimented on; nothing is left to chance or governed by rule of thumb; the reasons of all dairy operations are exhaustively inquired into and explained to the workpeople, who therefore work intelligently, and so fresh discoveries are always being made, and new improvements introduced. The use of pure cultures of bacteria as starters are universal; three different cultures are sold in Stockholm." I do not know how this excellent state of things has been brought about, but I know this, that if we want to be crowned with the laurels of the market we shall have to mend our ways. The Scandinavian weapons of conquest are, Verney says, "not in the main hostile tariffs or bimetallism, or lavish bounties, but—education and combination." And before our terribly despotic Minister for Agriculture inflicts upon us Queensland dairymen the Dairy Act of '98, I would suggest that he send someone, well up in the business, to Stockholm to discover how Swedes and Danes, who appear to be attempting another conquest of England, educate and combine themselves so as to bring the dairying industry to such a high pitch of perfection.

Mr. J. WILLIAMSON, of View Hill, Waterford, then read his paper on—

THE ADVANTAGES OF SEPARATED MILK OVER SKIMMED FOR REARING DAIRY CALVES.

The rapid expansion of the dairying industry in Queensland, and the interest taken therein, has brought forward the question of how to rear our calves with success so as to keep up the strength of our herds and also to improve them. This question originated lately in a very simple way, at one of the meetings of the A. and P. Society of Southern Queensland, by a member asking another (they being both dairy farmers) if he reared any calves, his method of feeding, and his success, &c. This brought on a discussion on the subject, and as the meeting was divided on the merits of the two milks, it was decided to have the matter publicly discussed. At a meeting convened for the purpose the discussion came off, two members speaking in favour of separated milk, giving their methods and success, and two speaking against, and in favour of the skimmed, and maintaining that separated milk was valueless for rearing calves. However, after lengthy discussion, the meeting decided in favour of the separated article. In speaking on this subject, I may remark that what I have to say on it has been gained from my own experience. Farmers having a journal of their own now, kindly published by the Minister for Agriculture and distributed by his department, it may be of benefit generally giving the methods I practice. It is now over 12 years since force of circumstances compelled me to centre my whole attention to dairying; and from what I have learned in that period I am satisfied that dairying is the chief spoke in the farmer's wheel. Inasmuch as his returns are coming in weekly or monthly as the case may be; he has not to wait 6 months for his crops to ripen, or run the risk of the climatic changes we are subject to. In the period above referred to I have reared calves on both the milks, 5 years on skim and 7 on separated, and will now endeavour to point out the advantages of separated milk. It is always sweet, and, if fed warm, after coming from the machine, it keeps the calf's stomach in a sweet, healthy condition, is always the same temperature, and, in fact, is in keeping with nature, whereas the skimmed is generally sour and in a curdled state. It must be warmed before fed, and it stands to reason that a calf's stomach charged with a ration of this food must act against the laws of nature. Moreover, there is always a disagreeable odour coming from calves that are fed on sour milk that is not found from calves fed with separated. In conversations I have had with farmers I came in contact with that are interested in dairying. I find there is a great difference of opinion with regard to the method of feeding calves; each one seems to have his own. I always make it a rule to leave the calf with the cow a week or so, as occasion requires, until the udder gets properly cleaned, whether the calf is intended for the butcher or kept to be reared. Cows that are heavy milkers are milked and it is fed to pigs. As soon as the udder is cleansed the calf is taken from the cow and put in a quiet sheltered place away from the cow and well bedded. Then comes the teaching process. I may remark, the person that undertakes teaching the calf to drink must be abundantly possessed with that great quality that Job had; if not, things are likely to get a bit complicated. I have found that a calf takes to drink sooner if fed a few times with pure milk, then

gradually decrease it, but maintain the quantity by adding separated. The ration that is given to my calves is from 4 to 6 quarts—that is when they have learned to drink—say from 4 quarts to start with, and as the calf grows older increase the quantity gradually to 6, and feed morning and evening; observe carefully that the froth, which is full of air, is properly skimmed off the milk before feeding, as it has a tendency to produce scour. The next thing to be observed is the regularity in feeding, and I have found this to be the principal factor in successful calf-rearing—feed regularly to time as near as possible; and the same rule follows as to the quantity. To my mind the farmers sending their milk to the creameries must be working at a great disadvantage in rearing calves, apart from the time lost going there, as it is impossible to have their milk always sweet. I am certain it would be to their benefit in every way to separate their own; they would also avoid the danger of introducing the germs of tuberculosis into their herds. Before closing this subject there is another matter I would like to mention that may be of benefit, having successfully reared my calves and weaned them. When about 6 months they were attacked for 3 years running with the fatal disease known as felon (commonly known as black leg). I consulted Mr. James Irving, veterinary surgeon, and stated my trouble. He told me there was no known cure for that disease, although there were many nostrums called cures, but there was one thing I might try, that was inserting a seton in the dewlap of the calf. He supplied me with several cures of linen tape about an inch wide, a tin containing a powder, a tablespoonful of it to be dissolved in a pint of water, and the tape to be soaked in it before using, together with a seton needle: that comprises the outfit. I acted immediately on the calves I had left, that was 7 out of 12, and the result has been that I have not lost one calf since, and I have been using it for the last 3 years.

DISCUSSION ON THREE PRECEDING PAPERS.

Mr. J. E. NOAKES (Maryborough): Mr. Rogers referred to the lax way in which local authorities carried out their inspection duties, and I can vouch for that. Local authority inspection is generally a dead letter, but in the matter of milk municipalities are often powerless. Take the case of Maryborough. There are no dairies in the municipality, and all the milk comes from Tinana, over which Maryborough has no powers of inspection.

Mr. W. DEACON (Allora): In preparing his paper, Mr. Rogers has forgotten that the preservation of the health and life of the people is a matter of paramount importance, and also that nothing so enters into this as the supply of dairy products. He will find, by considering the subject, that a good deal of the disease we have in the colony, and most of the fevers, have been traced to dirty and careless dairies. When we look at the way in which cows are allowed to go about the streets, eating all sorts of rubbish, in some of the towns, is it wonder that the milk is stuff that we should not put before our children? A Dairy Act may, I think, be left to the members, but I believe in the principle, and, with regard to the inspectors, all that talk about their sitting on the rail and watching the cows being milked is sheer nonsense. You might as well say that because people are appointed to detect crime they sit in stores watching to see if people steal. Even if the inspector has to watch the poor old woman milking her goat, still I think some sort of inspection is necessary. There is another point about the picture he gave of the extreme cleanliness of the dairies in Denmark and other parts of the Continent. I cannot speak positively, but I have an opinion in my mind that I read a report of a Commission, and my impression is that the report is altogether contrary to the statement made in the paper. Mr. Robinson has given us an excellent paper on the pig industry, and what he says is quite true. I think pigs are one of the most profitable things a farmer can go in for, although I do not think we can get 37s. to 40s. for a 120-lb. pig—and I have sold a good many pigs. The private buyer of pigs is very convenient, and if Mr. Robinson's suggestion about buying pigs by weight is established, the private buyer will have to do that just as well as the public buyer. I do not see why this pig industry should not be successful in every part of the country, especially here about Mackay, for I think a warm climate suits the pig. In a cold, frosty climate the pig requires a lot more food, and, consequently, in an equable climate he must be very profitable to grow and fatten.

Mr. J. MAHON (Agricultural College) : It is rather a big order to reply to Mr. Rogers's paper in five minutes, but I must compliment Mr. Robinson on his very excellent paper on the pig. No doubt Mr. Rogers meant well in preparing his paper, but I am quite satisfied that other dairymen who are here will be with me when I say that he knows nothing whatever of the requirements of the dairying industry. His paper is nothing more nor less than a copy of the evidence that was given before the select committee at the Legislative Council in 1897—that is, the evidence given against the Bill. Mr. Rogers referred to myself, and I may tell you that I was called upon to give evidence before this select committee. I did so in the interests of the dairying industry, and, before doing so, interviewed many of the leading dairymen of the colony, each of whom was satisfied that something in the way of legislation was necessary to protect the industry. At that time this Bill met with no opposition from the right direction, all the opposition coming from the proprietary men in Brisbane. Why? Simply because the proprietary men were afraid that the industry would get into the hands of the Government, or that the Agricultural Department would have control over the export. These gentlemen admitted right through that it was necessary something should be done in the way of legislation for the appointment of inspectors to control the dairying industry, but the fear of the proprietary men that the Agricultural Department would get a control over the export explains the whole drift of the opposition to the proposed measure. Mr. Rogers states that the inspectors have too much power, but so have policemen, and would the people tolerate any Government that allowed them to abuse it? Mr. Rogers spoke of the cleanliness of the Scandinavian and Danish dairies, but what is the reason of this? The Government enforces cleanliness there. In New South Wales it is enforced, and if you ride through the dairy districts of New South Wales you will see each man has his name registered over his door. The dairyman is not asked to build an elaborate dairy. All he is asked to do is to keep his dairy clean, and this Bill asks nothing more. I maintain the dairyman would not suffer under this Bill. Some clauses may appear rather stringent, but otherwise the dairymen would not suffer one iota, and a first-class and cleanly product would be the result, an article that would quickly make a name for itself on the foreign markets. In Brisbane now you will find inferior butter, and where does it come from but those dirty, filthy dairies which the Bill is intended to suppress. Mr. Rogers says we ought to educate the farmers to be clean. I shall not say farmers are not clean, but some are careless, and one careless one is enough to spoil the cream or butter of a district. We have educated the farmer. We have sent men round and preached to him that the most essential point in dairying was strict cleanliness. The farmers know that, yet nothing will compel a farmer to clean milk but an Act of Parliament. As for this Bill, it is purely a copy of the Local Health Bill. It gives exactly the same power as at present possessed by the local authorities, and nothing more. The local authorities have the power, but we know they will not enforce it. It can only be done by independent inspectors, and I think Mr. Rogers is very rough when he says an inspector can be got at. I think it says very little for Queensland if an honest inspector cannot be found. Again, Mr. Rogers refers to the manager of the Silverwood Company. He says that under the Act the farmer was prohibited from sending sour milk to the factory. I say that if he knew his business he would not accept sour milk. That is absurd, and proves to you that Mr. Rogers has no knowledge of the industry. Again, Mr. Rogers stated that the Bill compelled each man to have a certain cart. There is nothing of the sort in the Bill. It only provides that the farmer shall send his milk to the factory in a good and clean condition. At the present time you often see a man perched on the top of a milk can, contaminating the cream it contains, and I ask if this is a proper state of affairs? Then, as for machinery, we do not ask farmers to have elaborate machinery, but simply that he shall keep his place clean, and use a little time to destroy all impure germs. Mr. Rogers referred to me as saying that 6 inspectors could enforce the Bill, and I still maintain I was right. We

do not want a man to sit on the fence watching the dairymen milking. An inspector would soon discover the clean places, and one man would be able to inspect all the dairies on the Darling Downs. As for diseased stock, any man who is opposed to the destruction of these is no friend of the dairying industry. One diseased beast in a herd will quickly contaminate the whole of it.

Mr. W. TOFT (Rockhampton): I have listened to Mr. Rogers's paper, and have also read the Bill he refers to and the reports on it, and I am much inclined to think, with all due respect to Mr. Mahon, that he is misrepresenting Mr. Rogers's paper. I think those who followed it through closely will remember that he recognised the necessity of inspection, and for myself I made a few notes while he was reading it. While fully admitting the importance of inspection of all dairy produce in order to protect the public from being supplied with disease-bearing food materials, it also claims protection for the honest dairyman against unscrupulous inspectors. I do not say there are many about, but it is possible for them to exist, and the object of the paper is to protect a dairyman against harshness from inspectors. For instance, the idea is conveyed in the paper that the dairyman should have some sort of appeal, for under the Bill the only court of appeal is the Minister, and we know that the inspector is simply the servant of the Minister. One of the objects of Mr. Rogers's paper is to get a local board of advice, to which the dairyman may be able to appeal if necessary. According to my reading of the Bill, he is not able to appeal to the local police court. With regard to Mr. Robinson's paper, when I first came to this country, the only pork one could get was butcher's pork, and about the first drive I had in the country was past a slaughter-yard, where I saw about a dozen young pigs coming out from the carcass of a dead beast. I said to myself, "If that is the pork we have to eat in Queensland, I do not want any." Farmers and dairymen have since, however, taken the matter up, and it is very pleasing to note the progress that has been made in late years in the pig industry. You can now go into a butcher's shop anywhere in Rockhampton and get farmer's pork, and as for "butcher's" pork, people will not now look at it. That large sums of money can be made out of pigs has been proved in America, the old country, and the southern colonies, and I am certain that it will be the same in Queensland.

Mr. C. J. BOOKER (Woolooga): There is no man in Queensland in a better position to write a paper on the pig industry than Mr. W. R. Robinson, of Toowoomba. He is not only a breeder himself, but as a seller he comes into contact every day with the breeder, the fatterer, and the buyer of swine, as well as with the man who converts them into bacon. I say that for the reason I sold pigs myself in Sydney for 9 years, and a man doing that is in an admirable position to get a very sound idea as to the kind of pigs that suit the fatterer and bacon-curer the best. I regret that Mr. Robinson did not make a paragraph in his paper in connection with the best breed of pigs—that is, from a utility point of view. From my personal observation, and also as a breeder myself, I would just like to mention the Tamworth. He is a pig the Victorians are taking particular notice of, and I saw some time ago that Mr. George Chirnside, of Werribee Park, Victoria, not only an enthusiastic breeder of pigs, but all of high-class stock, sent a man to England to get the best pigs possible. When I was in Victoria some months ago, Bruni, of the *Australasian*, told me that these Tamworths of Mr. Chirnside had arrived, and that they were the finest pigs he had ever seen. The Tamworths up to late years have not had the same opportunities of distinguishing themselves in the porcine line as the Berkshires. I am speaking now in a hot climate, virtually in the tropics, and this is why I more particularly mention the Tamworth pigs. They are of a red sandy colour, and it is rather well known that that colour is good for a hot climate. The Tamworth stands the sun well, and moreover he is a very prolific pig, besides being a good forager. He has a slightly longer nose than the Berkshire, but it does not follow that he is any the worse for that, and, in fact, I think there is more solid utility in the pig with a good snout, able to forage among the nut-grass, than in an aristocratic, retrousse-nosed Berkshire. It is well known among breeders that the Berkshire with a decided turned up nose is not the best pig to use. The best Berkshire

pigs in Australia are those bred by the Walker's Trustees at Tenterfield, and these have not the fault I have referred to in the matter of snouts. It is not the snout, however, that makes the pig, but the length from shoulder to ham. The bacon buyer, when he inspects a pig, looks at its length and breadth, and buys the animal he can get the most bacon from. When I was a salesman and some pigs with a dash of Tamworth came into the market, I could almost always, when looking over the pens, name the man who would buy those particular animals, and he was the keenest judge there. I have often suggested to many of my neighbours to have a shot at any available Tamworths, and I was very pleased only yesterday to hear Mr. Mahon say that the Gatton College was going in for this breed. I feel sure that, if Mr. Mahon has not already seen the advantage of a dash of Tamworth, he will see it when his young stock comes on, for certainly to the general farmer, the Tamworth is the utility pig. Getting away from the question of breeds, it might be as well to make a few remarks relative to what Mr. Robinson and Mr. Deacon say about the advantages or otherwise of farmers sending their consignments of fat pigs to the central sale yards. In my experience, it is altogether the best system. If a private buyer goes out to a district, he invariably makes it a condition that the farmer shall deliver the pigs at the nearest railway station. The Railway Department gives the small farmer every opportunity to send 3 or 4 pigs on the rail at a uniform rate, and it costs no more per head to send half a dozen pigs than 25, so that there is nothing to stop a man sending his few to the central market. If I am a private buyer, and go to a man who has pigs for sale, it is needless to say I cut him down if I can. If I am bidding against my competitors, however, I am in a different position and have to make the highest bid if I am to get the pigs. From what I could see, the speculative man who used to go to the northern rivers of New South Wales buying pigs, used to make a lot of money, and I think it has been the same on the Downs. A pig that can be bought on the farm for 25s. would fetch 33s. at Toowoomba, and it would only cost a couple of shillings to send him there and sell him. As for the feeding question, I have found that an admirable feed for pigs, more particularly for breeding sows, and which is sufficient to keep them in good sound condition, is broadcast corn. Run it through the machine and make chop-chop of it. If you have any, mix some molasses with it and this will make, perhaps, the best food, next to milk, that you can feed to sows. A great trouble with sows is to get them into proper condition when about to pig, and if a man could only rear about 75 per cent. of the pigs that are dropped, pigbreeding would be very profitable. Sows, however, are so often fed on such heating food that they get too fat and are unable to nourish properly the young pigs when they arrive, but the broadcast corn I have mentioned meets this difficulty splendidly.

Mr. L. P. LANDSBERG (Rockhampton): I do not think Mr. Rogers objected to the health of the people being protected, but what he wanted was protection for the dairyman—say a Board to which he could appeal to. I think if the powers specified in the Bill are given to inspectors, that it will be the means of crushing out the small dairyman. I am a dairyman, and if that Dairying Bill becomes law I for one shall throw up my dairy. We know how the Diseases in Stock Act was carried out. If that Act had been carried out, I believe it would have been a benefit, but if you pass any stringent measure, the more stringent it is, the more likely it is going to be evaded. That was our experience of the Diseases in Stock Act. If it had been less stringent, it would more likely have been a benefit. There is the question of the destruction of diseased cattle. Under the Diseases in Stock Act, "any beast which has got a tick on it is a diseased beast." Therefore more than half of our stock are diseased, and would have to be destroyed. We could not use the milk from those cattle. If that measure were carried out, all the meat that is going to the works at the present time is diseased beef under the Diseases in Stock Act. With regard to Mr. Robinson's paper, Mr. Booker said it was hard to rear more than 75 per cent. of the pigs dropped. I have bred a good few pigs and have found that I could rear as a rule 90 per cent. I never kept a sow that dropped less than 8, and they

generally went up to 12 and 13. I used to feed them on general feed, such as sour milk from the dairy, and corn, green, with the stalk and all. The best breed of pigs that I have tried is the Berkshire, not the Berkshire with the turned-up nose, but the one with the more pronounced snout. I believe there are two breeds of Berkshires. As for Mr. Williamson's paper, in my experience, the best way of rearing calves is to take the calf away from the cow as soon as dropped, and feed it about a week or a fortnight on the milk from its mother, giving it as soon as drawn. Then gradually add separated milk, and finally give from 5 to 6 quarts of the latter twice a day.

Mr. H. CATTERMULL (Woongarra): I consider the Government would be justified in appointing an inspector for all dairies. A couple of months ago I was inoculating a herd in the Bundaberg district. The next day the owner came and informed me one of the beasts had died through the inoculation. I opened it and when we came to the lungs I found the beast was tuberculous. That animal had been milked twice a day, and its milk sent into Bundaberg, and I think it is quite time the Government appointed an inspector to enforce the destruction of such beasts. As for what Mr. Landsberg said, I maintain that a beast with ticks is diseased, Act or no Act. In the Bundaberg district, cattle in the last stages of redwater are being killed for food, and their flesh goes into consumption.

Mr. J. HUDSON (Rosewood): When writing of the question of the sale of pigs, Mr. Robinson speaks from the auctioneer's standpoint, but I would like to say a few words from the seller's. Where I live, we are about 50 miles from Mr. Robinson's pig sales at Toowoomba, and about 12 miles from Ipswich. There are no pig sales between those towns that I know of. Supposing I send my pigs to Ipswich, and they are not sold, what becomes of them? If they are sold, of course it is all right, but if not, I must be put to the expense of having them sent back, or else get rid of them at a loss in Ipswich. In order to meet our requirements, a man took out an auctioneer's license in our district, and had what was to have been a sale of pigs. He was boycotted, however, and not a pig was sold. Co-operation, I suppose, is the only remedy for that sort of thing. With regard to the question of rearing calves, it is a bad habit to allow the calf to use the cow at all. I have found that if you allow the calf to go with the cow for a week or so that the cow is continually looking for the calf, and keeping her milk back. In fact they often get dry through this, and altogether you are apt to spoil the cow. The best thing is to take the calf away, throw a sheet over it as soon as it is dropped, and never let the mother see it.

Mr. P. W. CAMERON (Ipswich): As a dairy farmer, I am looking forward very eagerly to the time when some Act like the Dairy Bill that has been so often referred to this evening shall come into force, and the sooner it is the sooner will all decent dairymen be pleased. At present, in a district the work of half-a-dozen clean dairymen may be nullified by one careless one, and as for tuberculosis and other diseases, I really think the destruction of affected beasts is the best remedy. We are all anxious for the health of our people, and should therefore look after the health and cleanliness of our stock. With regard to Mr. Robinson's paper, I have both reared and sold pigs, and certainly hold that auction sales are the best means by which to dispose of them. I feel certain that the auction system is the best for the seller, even though I who say it am a bit of a middleman. I believe in the calf being taken away from the cow as soon as dropped, but for the first week I always feed the calf on its mother's milk, and afterwards with separated milk.

Mr. R. J. BLAKE (Blenheim): I do not think Mr. Robinson's statements about the prices pigs fetch are correct; not by a long way. If a pig weighing a hundredweight touches 22s. 6d. or 25s., most pigbreeders think they are fairly well paid. The system we were working on in the Lockyer district was for a representative of one of the big bacon-curing firms to go round to the farmers, and say, "You brings your pigs into Laidley on such a date. I shall be there." The farmers had to bring the pigs in or leave them at home. They were bundled into the yards, and the buyer would say such a pig was worth so

much, and the farmer had to take what was offered or else go to the trouble of taking his pig home. As this was very irksome to the farmers, local auction yards were established, and they were carried on for a month or two with a certain amount of success, fairly good prices being realised. The buyers, however, then determined to put a stop to the auctions, and about 2 months ago, 300 pigs were yarded, and when they were put up not one was sold, not one buyer turning up to bid for them. One of the bacon firms had an agent there, and he immediately wired to his principals the facts of the case. The result was that a buyer was sent up, and he got every pig at his own price. The farmers came to the conclusion that there was no other remedy for the evil but co-operation, and they made a move in that direction then and there, several hundred shares being taken up before the people left the yards. The Meat and Dairy Act would perhaps be able to assist this co-operation, but a dairy must be clean, and I do not think that in our district a dairy and a bacon-curing establishment could be very well worked together. If they start a co-operative bacon factory alone, I understand they are not entitled to any assistance from the Government.

The Hon. J. V. CHATAWAY: One moment. There is another vote of £10,000 that was passed on last year's Estimates, which is available for any such work as that to which Mr. Blake refers.

Mr. BLAKE: In any event we have made a start, and I hope you will hear ere long of the successful establishment of the Lockyer Co-operative Bacon Factory.

Mr. F. W. PEEK (Loganholme): I think we should all feel thankful to Mr. Robinson for his paper on pigs, and it is hardly necessary to mention that Mr. Robinson is a great breeder of this stock. As for the suggestions about the best methods of disposing of pigs, I may state that my association have at present this matter in hand. Up to the present time most of the proprietary companies, &c., who manufacture bacon, have been in the habit of sending buyers round to the farmers, and I do not say they have not given satisfaction. In some cases farmers are very well satisfied with the prices they get, but the prices mentioned in Mr. Robinson's paper do not obtain in the Logan district. I have seen splendid pigs, from about 130 to 140 lb. in weight, disposed of at 30s., which is about the highest price that could be got for them. They are chiefly Berkshire about the Logan and there are heavier animals than the weights I have mentioned, but the farmers use them for home consumption. As I said before, my association have had in hand this question of the betterment of the pig market, for the system that has been going on hitherto is not altogether in accordance with the wishes of the seller. We communicated with the largest proprietary firms in Brisbane and got different answers. Hutton (I do not suppose there is any great secret about the names) said that they did not favour the auction system, but preferred sending buyers round to the different growers, who would also give advice as to the kind of pig required.

Mr. BOOKER: That supports Mr. Robinson's contention.

Mr. PEEK: Howes Bros., of Oxley, said they would fall in with the views of our Association; that they were in the habit of sending a buyer round, but they asked us to consider if it would not be better to establish open sales, each farmer taking his pigs to the yards, and the buyer going round from one pen to another. The Graziers said they would support any auction, and that they would deal direct by auction at local sales. This firm considered the auction system would save them the expense of sending men round to the different farms. In the matter of the question of the sale of pigs by weight, we thought it would be a good idea to have a weighbridge established in the pig race. After thus going into the matter we decided to go on with auction sales, but before doing so we again interviewed the Messrs. Hutton to see what their objections to the system were. Their manager told us that his objection to auctions was that he frequently found that a sale was advertised and their buyer attended, but found that the pigs had all been bought up the previous day by the auctioneer, who, when the sale came on, ran them up against the

buyer, the result being that the auctioneer got the benefit of the system, and not the farmer. We told Hutton, however, that we were going to start as a co-operative venture, and that our Association would take the whole of the sales under its control, and that the charges for sales would be fixed on a sliding scale. We then wrote to the Railway Commissioner asking for permission to erect pens. The Commissioner replied that he would not allow the cattle-yards to be interfered with, but we could erect pens at our own expense, and we could have the privilege of holding sales at the railway station by paying 5s. per sale. The Dairying Bill to which Mr. Rogers has referred was discussed by our Association, who considered its provisions too drastic, and, for my part, I do not think the Government will again bring it forward in its then shape. As for education in dairying matters, it may be mentioned that in the Kingdom of Würtemberg, this matter is taken in hand very early, and the girls are instructed in dairying subjects at school.

Mr. M. O'KEEFE (Blenheim): With regard to Mr. Robinson's paper, I shall commence by saying that Mr. Robinson is about the most honest auctioneer I know of—honest in an honest endeavour to establish a pig market for Southern Queensland. Now, gentlemen, this brings me to the matter of the frequent desire of persons interested in the middleman's trade to tender information and advice to the farming population. It amuses me; but at the same time it arouses in my mind, and in the minds of other farmers, a distrust of that very advice. Why should they undertake to be the advisers on the question of co-operation? Why should they constitute themselves the advisers on that question, knowing that they must be utterly opposed to co-operation by their interests? I know that it does a great deal towards stopping the advance of co-operation. It throws a damper upon the minds of many timid farmers who would otherwise enter into co-operation. With regard to the system of sales as brought up by Mr. Blake, it may be remarked that the buyers do not go to the farms themselves to buy. They put up a notice on a tree that a buyer will be at a certain place on a certain date, and you must bring your pigs in there. You are then told what price you are going to get for them, and you have no say whatever in making that price. If that price is 25 per cent. less than the value of the pigs, I doubt if any farmer will try to bring them back to his farm. As far as I understood Mr. Rogers's paper, he considered the Dairying Bill too stringent, but I say without any hesitation that there has been for many years among farmers and milk producers a strong desire for strict supervision over all dairying matters. I say, further, that it is not the farmers and producers of milk who are afraid of strict supervision, but it is those interested in the manufacturing trade, who feel that by some means or other this strict supervision may take out of their hands the strong control they have over that very trade. I might refer to the advice that has been given to the Department to take further steps for educating farmers on dairying matters, as it gives me the opportunity of complimenting the Department upon having educated our farmers on this very subject, and upon having succeeded in educating them. It has done all that it should be necessary for it to do, unless it is going into the whole business and milk the farmers' cows for them. In the past the Department has sent experts throughout the length and breadth of the land to educate the farmers upon dairying matters generally, and should any desire to go in for co-operation, to assist them towards that object. Farmers may also take advantage of the special loan for co-operative dairy purposes. What further steps can we expect the Department to take? I understand that loan money has been available for two years, and only Gympie and Bundaberg have taken advantage of it. No advantage will perhaps be again taken of it if we listen to the advice of those in the trade.

Mr. F. G. JONES (Biggenden): I have to thank Mr. Rogers for bringing the matter of dairy control up. While admitting that some inspection may be necessary, I consider the Bill, as drafted, was altogether too drastic, so much so that instead of encouraging dairying it would simply strangle it. I had read the Bill through, and had made arrangements, if it was carried, to give up

dairying and go in for agriculture. I am quite willing to submit to inspection, and can say the same for other dairymen in my district, but I have reason to dread that Bill. As to the clauses for the destruction of diseased cattle, I think there should be one for compensation purposes. Dairymen are not veterinary surgeons, and they may have so-called diseased animals without knowing it. I therefore think the lines followed in the old country should be carried out here, where a certain proportion of compensation is allowed for animals destroyed under these Acts. While I cannot agree with Mr. Williamson that separated is better than skimmed milk, I am quite in accordance with his methods of raising the calves. I have tried both methods, and when I took the calves from the cows immediately they were dropped, my losses from scour amounted to 50 per cent. We have now adopted the other method and let the calf run with the cow for a week or 10 days. I then feed it with fresh milk and then with skimmed. We have had 100 calves this season, and our losses have only amounted to 2 per cent. Separated milk by itself is not sufficient, and you must add something to it, pollard being as good as anything that can be used. A good deal depends upon when the cows calve. If in the winter, you have to feed them longer than you otherwise would. If in early spring, you can get them off earlier. As for pigs, I can bear out what Mr. Booker says on the value of the Tamworths. Forty years ago, in the Midland counties of England, it was the favourite pig. Then the Berkshires came and took their place, but I understand now that the interest in the Tamworth is reviving.

Mr. J. PARKE (Tinana): I have been working with pigs for a good number of years. In fact, I have been rearing and slaughtering them for about twenty-seven years, and I am not going to give them up yet. As for breeds, I do not distinguish by the snout, but by the coating of hair. One Berkshire is thin-haired and the other thick, and I believe in the latter. As for feeding, the greatest difficulty I find is in keeping my breeding pigs lean enough. My sows get too fat, and are rather liable to smother their young ones. I have fenced in a paddock of about 9 acres for them, and supply them with plenty of water. Their chief food consists of separated milk and fruit that is unmarketable. In the pig patch I have planted a number of fruit trees—mangoes, guavas, and so forth—and let the pigs collect the fruit and feed themselves. To stop the pigs from ringbarking the trees, I have had a piece of hollow log placed round the bottom of the trunk of each of them. As already stated, my great difficulty has been in keeping the sows in low enough condition at time of pigging, and I am much indebted to Mr. Booker for the remarks he made about feeding sows, the only drawback being that in many localities it would be difficult to obtain molasses cheap enough. As for prices, I find no difficulty in disposing of my pigs. What I can always get at Maryborough is 3d. per lb. for the dressed meat, and all the pigs I dispose of are dressed at my own place and brought to the factory.

The Hon. J. V. CHATAWAY: The views of the farmers at this Conference must have altered very much since last year if Mr. Rogers's paper and the views therein find any sympathy. Last year there was a strong feeling that the inspection of dairies and cattle should be insisted upon, and to a much greater extreme than has been proposed in the Bill. One farmer, indeed, read a paper to show that the spread of cancer in Queensland was caused by the slaughter and use for human food of cancerous cattle. I just wish to deal with one or two statements. It has been said that under the Diseases in Stock Act, animals that have ticks are diseased. I wish the gentleman would read the Bill. Animals suffering from tick fever are diseased; animals covered with ticks are not. Lots of arguments are founded on statements that have no foundation in fact. Mr. Rogers said that tuberculosis was never traced to milk. I have in my hand the very last book on the subject, the Harben Lectures, delivered by Sir Richard Thorne in 1898, and herein it is stated that any person who takes tuberculous matter into his body as food takes the risk of incurring tuberculosis, and that the milk of cows with tuberculosis of the udder possesses an extraordinary virulence. This

evidence outweighs any dictum of Mr. Rogers that there is no proof that tuberculosis can be conveyed to human beings by the food consumed. Mr. Rogers referred to the large decrease in consumption, and in pulmonary consumption there has certainly been a decrease, owing to improved sanitary arrangements. Pulmonary consumption is generally supposed to be taken in through the medium of the air breathed into the system. Now, there has been an immense decrease in it, a decrease in England of something like 45 per cent. In the form of tubercular diseases, which are mainly given to children through milk, there has been an enormous increase, an increase through a series of years of 27 per cent.; that means that the closer herding of cattle is no doubt clearing off the children of the world in greater numbers than formerly used to go off from this cause. I have taken out the Queensland figures, and it is perfectly shocking to note the proportion of infant deaths which have arisen from tuberculous diseases, which no doubt were largely preventible. We had a little child in the Brisbane Hospital only three weeks ago full of tubercles, and we had it sent out into the country. Its father lived in a healthy place, but on inspecting his cows two of them were found to have been rotten with tuberculosis. Why should our children be killed? The same arguments brought up by Mr. Rogers have been brought up against all inspection. They were the same arguments that were brought against the Slaughtering Bill and the Factory Act. If many people were to see some of the dairies of the country, they would never drink milk again. Did we not send an inspector to South Brisbane only to discover cows rotten with disease, the matter from their udder sores dripping into the milk buckets? That any man can stand up here and oppose efforts at the remedying of the disgusting condition of many of the town dairies, I can hardly understand. I have been in New South Wales, where there is an extremely stringent Act, but I never heard a farmer say he had any objection to inspection, and several of them have told me that they would now do of themselves what the inspector requires them to do if he were not there—that is, they recognise that what is insisted upon by the Government is really for their own benefit. Of course, there is a much meaner way of looking at this inspection, and that is at the benefit it confers on our trade. It is notorious that 25 years ago the United States had practically the monopoly of cheese in the English market. But the United States forgot to inspect, and the consequence was they lost all their export trade in cheese to England; Canada, a country with much less natural advantages, being their successor. On the Continent there is a Government inspection of the very strictest sort, and I hope we shall yet see an Act in Queensland which will compel dairymen to turn out of their herds cancerous and tuberculous cattle.

[Mr. Chataway then temporarily left the meeting for the purpose of opening the show of the Pioneer River Farmers' Association, his place in the chair being filled by Mr. P. McLean.]

Mr. R. S. AIKEN (Gooburrum): I think Mr. Rogers's paper has been criticised by the Chair under a great misapprehension. Mr. Rogers is a stranger to me, but I do not think he intended to convey the ideas suggested by Mr. Chataway, and in any event I feel sure that the paper has been written in the interests of those who are engaged in dairying at the present time.

Mr. C. ARTHUR (Brisbane): The main idea that has been conveyed here to-day is that the dairying and pig industries have been tremendous successes. They have. And probably the greatest blessing arising from the prosperous condition of these two industries is the provision they give to farmers to settle their sons on the land. The inspection of dairies is essential, and in places where it is enforced I do not think it has ever become oppressive, the inspector standing between the seller and the buyer. Previous to the commencement of inspection around Brisbane, the condition of many of the dairies was simply disgraceful.

Mr. S. E. TOOTH (Pialba): In my district we combine dairying and general farming, and I think it is time something was done to put an end to the filthy way in which many dairies are conducted. I have seen butter, cheese, and

dishes of milk kept in bedrooms—in fact, under the beds in which the people sleep; but the establishment of a creamery has put an end to most of that sort of thing in our district. The dairyman sends his milk away every morning, but still the creamery does not take the milk on Sundays, and it often goes into the bedrooms on that day. Down there you see bulls going about in the bush from 5 to 10 years old, and of course this has a deteriorating effect on the herds, for many people there let their cows go outside of their own property. In the matter of separated *v.* skimmed milk, Mr. Williamson advocated each farmer having a separator of his own, but the factories themselves are against these private separators, preferring that the farmers should sell their milk to the creameries. This results in an even grade of cream, but it prevents the farmers from getting their skimmed milk back sweet, and so about Pialba it is served out sour and thick. For Sundays, a little is saved over from Saturday. Calves that are fed on skimmed milk should never get water. Although not a pigbreeder on a large scale, I often have about 100 in the yard, and for a market I always dispose of my pigs to butchers or private people in Maryborough in the form of dressed meat. In large districts the disposal of the pigs by auction on the co-operative principle may work satisfactorily, but I can always get 3d. per lb. for mine in the manner indicated.

Mr. J. E. LEASK (Bundaberg): There may be a few stringent clauses in the Bill referred to by Mr. Rogers, but at the same time the authorities are not likely to go to extremities in enforcing it. That there is a great deal of filthiness in connection with many of our dairies can be amply proved, and I have frequent evidence of it myself from the managers of our various creameries. These gentlemen have frequently told me that it is not an unusual thing, when emptying the cans of milk into the vat, to discover drowned rats in the milk, as well as all manner of other unclean things. Why it is that our butter at times is not up to first-class requirements is very easily summed up, for with unclean milk it is quite impossible to make first-class butter. As for farmers who run small separators, it is quite impossible to get a uniform grade of cream from them, and in fact the test runs from 25 to 56 per cent. With such variations it is almost impossible to make a high-grade butter. During the early part of this year the Bundaberg factory was making more butter than it could sell, and the consequence was that a considerable quantity had to be exported to England. The manager of the factory, Mr. Gibson, was very careful in selecting the best cream from the best centres, and having it specially churned. Twelve tons were exported, and when the returns came to hand it was found that the Bundaberg butter had got the highest price then ruling for colonial butter in London, and this was in competition with New South Wales and Victorian butter. The highest price then ruling for colonial butter was 88s. per cwt., and I think that the careful supervision and inspection of dairies would result in an even grade of cream which would produce a butter in Queensland equal to any made in any other part of Australia. I, for one, am much in favour of something being done to remedy the present careless and dirty methods of some of our dairymen.

Mr. A. C. WALKER (Knockroe) asked whether it was possible to rear a calf exclusively on separated milk?

Mr. W. DUNN (Beenleigh) stated that he did not believe in rearing too large litters of pigs, and although he preferred the Berkshire breed, was not altogether in favour of using pure-bred animals. A cross-bred sow and pure Berkshire boar would generally give the best results, and also probably do away with the danger of over-fattening which some of the speakers had mentioned.

Mr. E. N. ROGERS (Rockhampton): My paper evidently has been largely misunderstood by many of the delegates present, who seem to think that it was written with the object of opposing inspection or an Act of any sort, although nothing of the kind was intended. I believe inspection is necessary as well as compulsion; I pointed out that local control had failed, and that some sort of central control was needed. I merely said it was proposed legislation I was dealing with, to which the Government were not committed, and I avoided giving

names, for I did not want the paper to be considered an attack upon the department. Mr. Mahon rather sought to discredit my paper by calling it a copy of a report of the select committee on the Bill, and stating that I had no knowledge of the requirements of the dairying industry. Many practical dairymen, who have objected to the stringencies of its provisions, have, however, spoken to me on the subject of this Bill, and that was the main reason I brought it up at this conference, for I do not dispute for a moment that the object of the Bill—the preservation of the public health—is a good one. Mr. Mahon said I advocated the education of farmers, but what I said in my paper was that the Bill relied on direct compulsion rather than on education, and I also wished to show that the farmers' children should be educated. We want to catch them young, to teach them dairying during their primary education, for we should not merely want to educate managers. As for tuberculosis, my main contention was that the Government have been very lax in connection with this matter hitherto, and I do not think it would be just to hurriedly start stamping it out without making provision for compensation. It is hard to say to what extent tuberculosis prevails in Queensland, but I have heard it put down at 20 per cent., and when we consider the immense number of cattle we have in Queensland—about 6,000,000—it can easily be understood what an immense undertaking it would be to stamp out this disease at once from our herds. I hold the work should be proceeded with cautiously. It is all very well to say inspectors would not abuse their powers, but we know that they do. When the Diseases in Stock Act was hurriedly passed, Mr. Hardacre supported it because he thought it would do a good deal of good, but after seeing what the effect of the Act really was, that gentleman publicly stated the regulations for the stoppage of the ticks had done more damage to the pastoral industry than the ticks would have done. When managing Glen Prairie Station, I tried to get some red polled bulls from the south, to try on short-horns, thinking that the cross might, perhaps, be less liable to ticks than the shorthorns, but, thanks to the many difficulties put in the way by the tick and quarantine regulations, the experiment had to fall through. Mr. Mahon said 6 inspectors would be sufficient to enforce the Act, if passed. But my objection to the inspectors is not that they would be dishonest, but, simply, such extensive duties would be imposed upon them, and such varied knowledge would be demanded from them, that it would be impossible to get suitable men. Mr. Mahon himself admitted that he never met a man who was properly qualified to fill all the duties of an inspector under the Dairy Bill.

Mr. ROGERS concluded his remarks by moving that his paper on "Proposed Dairying Legislation" be referred to the Resolutions Committee.—Carried.

Mr. G. PALK (Loganholme): It is my experience that you can rear calves on separated milk better than on anything else, and I do not think I have lost 2 calves during the last 10 years when I have been feeding them on it. I have seen no scour in them, and they get nothing but the separated milk.

Mr. WILLIAMSON (Waterford): Mr. Tooth stated that butter factories objected to dairymen doing their own separating, but in our district nearly every farmer has a machine of his own, and there have not been three creameries established within my neighbourhood. The farmers found there was too much time lost in running to the creamery, reckoning it often as half a day, and the consequence was, they went in for their own separators, and now send their cream direct to the butter factory. This is found to be more profitable as well as more convenient, for while, at present, they can separate their milk at their own leisure, under the old system they are forced to go in all weathers to the creamery, and when there, perhaps, waste time waiting for their turn. Personally, I do not send my cream to the factory, but manufacture and sell my own butter. I add nothing to the separated milk when feeding it to the calves, and I feel sure that anyone who tries it will find it a success. The chief factor in success in feeding calves is to feed regularly to time, and give the same quantity each time. Two gentlemen stated they believed in taking the calf

away from the cow as soon as born, but my opinion is that nature has provided the food for the calf, and if the calf is allowed to suck, it gets a start and its machinery is set going. As soon as the udder is properly cleaned take the calf away.

Mr. T. S. BEATTY, of Collaroy, St. Lawrence, then read the following paper:—

A MINISTER FOR THE BUREAU OF ANIMAL INDUSTRY.

It is almost needless to preface my remarks under this head by saying that nothing in this paper reflects in any way on the present administration of the pastoral affairs, neither does it wish to detract from the value of the Agricultural Department, or its able and competent staff. But it is in order to show the necessity of separating the Agricultural Department from the pastoral industry that this paper is written. At the last Agricultural Conference held in Rockhampton the Minister quoted figures showing the enormous strides in the output of wheat, butter, cheese, &c., and the ever-increasing demand for land for closer settlement, and the Under Secretary, speaking of the work and progress of his department, said the work was increasing by leaps and bounds, often taxing his whole time and attention to keep pace with the daily requirements and progressive demands. Now, this is a sufficient reason for the separation of the pastoral from the Agricultural Department. The ever-increasing wants and large volume of business connected with the agricultural industry are sufficient, without having the great pastoral branch tacked on to it. The export trade of the pastoral industry represents £5,000,000 out of a total export trade of £9,000,000 of the whole colony, and yet it has no direct representation in the Cabinet; all the work has to filter through the Minister for Lands or the Minister for Agriculture. One would have thought that with all this expense, worry, and trouble over the ticks, with hosts of inspectors, quarantine laws, and regulations, that the first thing the Government would have done would be to appoint a special Minister to preside over so vast and important a branch of this revenue-earning industry, but all that was done was to form an Agricultural Department and tack the enormous business of the pastoral industry on to it. Now in point of wealth and importance to the revenue-earning power of the colony, the position of precedence should have been accorded to the pastoral industry. But we do not grudge the agricultural portion of our community the high and important position to which it has attained. We say the time is now opportune, and necessary, for the great stock-raising industry, with all its manifold ramifications and importance as a wealth-producing industry, to have a direct head in the Cabinet of the colony. The question of diseases in stock, regulation of our local meat consumption and export trade, the breeding of good horses, a tax on stallions used for hire or allowed to run loose, and the use of expert classers for wool and sheepbreeding, and how to breed the best paying stock—all these matters require and demand a qualified and experienced man to rule over the pastoral industry, to watch with zeal how to facilitate the rapid expansion of the Tweed graziers, who are now closing up the great gaps in the large runs of the interior. The time is not distant when the present system for assessing the rent of Crown lands will be abolished, and the rent be requested by the average results of profit from increase and sales. All these and many other matters pertaining to the welfare of the industry might well receive the earnest attention of the to-be new Minister, and we hope the session will not close without some provision has been made for the portfolio of a Minister for the Bureau of Animal Industry. With the advent of federation, it will be necessary to have uniformity in our laws and regulations for travelling stock, diseases in stock, and the more efficient control over the export trade and meat used for home consumption, and the vast interests at stake are too important and too serious to defer them. The evolution of the so-styled squatter is gradually being developed by the advent of the grazing-farm system, and with the increased value of sheep in Queensland, there will be double that number. The progressive policy of the present Government, as foreshadowed by the Premier, is a good augury for our trunk lines to be pushed into the interior. Add to this a system of providing artesian water to grazing farms, then the vast extent of now waterless country will soon be dotted with houses, and a thriving community established. Many may say that the grazing industry is the "fat man's" portion, and is well represented and cared for by the majority of the members of the House, also by the members of the Upper House, but if such has been the case in the past it is not so at present, and it is a well-known fact that what is everybody's business is nobody's. The business of stockraising is a speciality, and one of the earliest in history, and it requires a special and qualified head to supervise it and represent it in the Cabinet. Our worthy and efficient Chief Inspector of Stock, who has filled this office since its inception, can tell

us the great strides pastoral settlement has achieved since he first took office, and the enormous increase in stock in the colony: also the export of wool, beef, tallow, hides, and other pastoral produce, which swell the total up to £5,000,000 sterling. We therefore ask with confidence for a Minister to devote all his attention to our industry, which for many generations must be the primary one in Queensland.

SEVENTH SESSION.

THURSDAY, 29TH JUNE, 1899, 9-30 A.M.

The Hon. J. V. CHATAWAY: The first business for this morning is a discussion on the papers of Messrs. Denman, Pott, and Henry, and, with regard to the two former, I have here a recommendation from the Resolutions Committee suggesting that they be discussed on the following lines:—"The benefits bestowed by the sugar industry on the colony: its future prospects; countervailing duties; light agricultural lines."

Mr. R. S. AIKEN (Gooburrum): I would like to say a few words in reference to countervailing duties. We who are engaged in the sugar industry have a great number of troubles, and to relieve us of one of these, we advocate countervailing duties, for the simple reason that we find that the bounty system on the Continent of Europe oppresses us in such a manner that we absolutely require some assistance from the Government to enable us to compete with it. We are not altogether believers in the system of countervailing duties, but circumstances absolutely force us to do something to protect ourselves, and, as you are all aware, the bounty system allows those growing beet to place their sugar against ours in the Australian market at such a price that we are unable to compete with them. Therefore, to put it in a nutshell, and not occupy your time too long, it is the desire of those who are engaged in sugar in Queensland that the present Government, whom we have to thank for assisting us in several ways, shall take action in this matter. I am sure we have a gentleman as Minister for Agriculture in whose hands we are all quite willing and satisfied to leave the matter, knowing full well that we shall receive what we are in mere justice entitled to.

Mr. W. DEACON (Allora): With regard to countervailing duties, it may be stated that 2 of the delegates from Mackay at the Agricultural Conference at Gatton, in 1897, brought forward a resolution on the subject, but the time was not altogether opportune. In fact, Messrs. Denman and Swayne were slightly before the time, but now I think the subject is ripe for any discussion. The annual production of beet sugar is something like 4,600,000 tons, and of cane sugar 2,600,000 tons, so that, consequently, the cane is falling before the beet all over the world. In Britain, where they used to refine their own sugar, there is just about one refinery left, and that is at Glasgow. Practically all the sugar now used in England is beet, and I believe beet sugar is also used even in Queensland, that is to say, all the loaf sugar made in the world is from beet. (Voices: No.) I make that statement on the authority of the *London Daily Telegraph*, and understand that such has been the case for the last 25 years. Some people in the north of England, however, still adhere to the cane sugar, and the imposition of countervailing duties in the United States has had the effect of drawing away all the sugar from Demerara to the States, and, in fact this latter country has practically annexed the commerce of the West Indies and Demerara. I understand the bounties in France are 4s. per cwt., in Germany 1s. 6d.; and we are told that Germany, Austria, and Belgium would be quite willing to give them up, but that France bars the way. The effect of it is this, that while in England good sugar is procurable from 1½d. to 2d. per lb., the same article sells for 6d. on the Continent, owing to the excise levied to provide for the bounty. A few months ago countervailing duties were imposed in India. So great had been the rush of sugar on the Indian market from Germany that it was practically destroying sugar-growing in India, and the Government had to do something for the protection of their growers there, the imports of sugar into India having risen from 200,000 cwt. to

1,000,000 cwt. in the course of 2 years. There are 3 countries in the world that impose countervailing duties: the United States, which has a duty on a duty; India, and (Mr. Denham informs me) Canada. Is it, then, too much to expect that we should express an opinion on the subject? If we support the empire loyally, are we not entitled to consideration from other parts of it? Sir Horace Tozer made some remarks upon this question, and although I do not exactly know what they were, and even if he did go a little too far, yet I think he is entitled to our thanks for bringing the matter forward. If we pass some resolution at this Conference and forward it to Sir Horace Tozer, it would strengthen his hands and the hands of those in Great Britain who wish to impose countervailing duties. I have therefore prepared the following resolution which I would have liked to have seen either Mr. Denman or Mr. Swayne propose; but as it would perhaps come better from a Southern delegate, I beg to move—"That this Conference of delegates of the agricultural societies of Queensland emphatically protests against the unfair competition entailed upon the sugar industry of the colony by the bounty system of certain countries of Europe, and they sincerely hope that the United Kingdom and the various British colonies will follow the example of the United States and India by imposing countervailing duties; and, further, that the Premier be requested to telegraph the foregoing resolution to the Agent-General in London, and also to forward copies of it to the Premiers of the various British colonies."

Mr. W. BEALE, of Childers, seconded the resolution.

Mr. C. ATTHOW (Brisbane): In all industries the great question is markets, and anything that will open and improve those markets is an object to be aimed at by all friends of an industry. For sugar our markets are now, and will be for a good while, found in the South, and a thing that will improve them there is federation—that is, with a tariff against outside sugars. We are not likely, however, to get that tariff unless we amalgamate with the Southern colonies, but amalgamation and a high duty on bounty-fed sugar would result in the opening of those markets to us. As for the ill effects of federation in connection with the sugar industry, we come to the labour question. Some say it is impossible to do without black labour, and although I shall express no opinion on the matter, it is evident if no white labour is procurable, that black must be employed if the industry is to be carried on. If we federate, it is said that the Southern colonies will at once upset black labour, but I do not think they will if it is carried on in a fair manner, and is not applied to any other industry than tropical agriculture. As for the danger of not being properly represented in the confederation, it should be remembered that although we have not the representation the central States will have, yet the outside States combined will have a greater representation than the central ones, and will be in a position to be able to outvote them. The Upper Chamber, moreover, will safeguard the interests of the weaker States. As for the future prospects of Queensland, they are certainly dark if the federation is not entered into, for the reason that the other colonies will probably impose high tariffs in order to drag us into it. The question then is, Are we going to trust the other colonies in the matter of not disturbing the question of black labour so far as it affects the sugar industry, or are we to chance them raising heavy tariffs against us? I for my part think we ought to trust them.

Mr. J. E. NOAKES (Maryborough): I have great pleasure in supporting Mr. Deacon's motion. At Gatton, 2 years ago, a similar one was brought forward, but at that time the people of England were not educated to the point they now are. I do not think there is much necessity for discussing the black labour problem, for it is one that will settle itself, although if it is abolished, it would be difficult to say where we are going to get our sugar from. However, there is no country in the world where so much white labour is employed in connection with the cane sugar industry as in Queensland. In Java, Mauritius, &c., they are all black men who grow it. One of the great objects of putting bounties on beet is to keep the people in the country in order to provide material for the continental armies and navies.

Dr. THOMAS (Cairns): I have much pleasure in supporting Mr. Deacon's motion, and may add that I know something of growing beetroot. The powers of Europe do all they can to foster this industry, and they do the right thing. They help themselves, which is a stronger reason why we should do all we can for ourselves. Two or three years ago, one European country imposed 100 per cent. duty on imported cane sugar, and when they in Europe are thus doing all they can to support the beet industry, we are surely asking delegates very little when we ask them to support Mr. Deacon's motion.

Mr. D. WATSON (Woongarra) strongly advocated the appointment of agricultural chemists for the chief sugar districts, and in support of his contention, read out the report of the deputation that waited upon the Minister for Agriculture in connection with this subject.

Mr. B. O. BROOKES (Johnstone River): At present we are growing sugar, and are trying to pass legislation to enable us to export, because our production is already in excess (or on the very edge of it) of what we consume. When we do export we shall have to compete against the world, and it will be interesting to consider what equipment we have to do this. We have labour, but it is expensive, and in most other cane-growing countries they have the native labour, which is cheap and plentiful. These countries we shall have to compete against, and it is therefore very important, if our production is to exceed our consumption, that steps be taken by the Government to supply us with a plentiful supply of labour at a fair rate, and at a cheap rate. This appears to me to be the most important question at present in connection with the sugar industry.

Mr. W. GIBSON (Bingera): A question before the Conference at the present time is the furtherance of the sugar industry by light lines or otherwise, and the time has come when every individual who is engaged in the growth or manufacture of sugar should take into consideration the best ways and means of producing it at the lowest possible cost. In the first place, there is the advantage of light lines in places where they are practicable, and although in some districts they may not be practicable, yet I may state that in our case we have been able to run portable lines in very difficult places with profitable results. With light lines the first loading of cane is the last, and by sending them out to awkward places a big saving in the production of the cane before it comes to the mill is effected. In our case, the saving from the portable tramlines over the loading and unloading of drays is something like 9d. to 1s. per ton. That is a very great consideration and it certainly assists towards the matter of profit and loss. We all know that, at the present time, labour is getting more expensive and that sugar is not rising in price, and this is a question that requires our closest attention. I, for one, would not like to see anything done by Act of Parliament in connection with our labour; but there is one little point that I would like to see agreed to among ourselves if possible, and that is the term of the boys' agreements being extended from 6 to 12 months. The short agreements that are in vogue at the present time are injurious to the labourers themselves, for we all know very well that when boys are engaged on the various plantations who have been walking about for a number of months, very many of them are quite unfitted for work. They are not only unfitted for work themselves, and their morals have got so corrupt, but they injure the young lads and new arrivals in a like manner. I consider that if it were possible that no agreement should be under 12 months, it would be an advantage to the boys themselves, physically and morally, as well as to the growers of the sugar-cane. As for the chemist that has been talked of, it may be stated that we have had some experience on that question. At Bingera we have had a chemist for a number of years, the various parts of our fields have been dug up to a depth of 18 inches, the various soils brought before the chemist, the chemist has made analyses of them, and we have to-day in our laboratory samples of all these soils, their analyses, and the foods required for them. These chemical analyses may not be able to always lead you to definite conclusions, but still they give you ideas to go by and data to work on when

you intend incurring expense in connection with your land, and which will doubtless frequently save you from putting high-priced manure on to it that would give no result. A halfpenny per ton on the cane produced would provide for such a chemist in the Bundaberg district, and the payment of such a tax would not break anyone. For a farmer growing 500 tons of cane it would only amount to 21s., and the benefits would far outweigh the expenditure. Our farmers will stand very much in their own light if they do not take some active steps to strengthen the hands of the Minister to do something in this matter of providing agricultural chemists, a matter that would be provocative of the greatest benefit to the whole agricultural community. As for federation, it is a matter of the greatest importance to everyone engaged in the sugar industry, whether he be canegrower or manufacturer. When at Circular Quay in Sydney lately, a German steamer from Bremen was pointed out to me as capable of carrying 20,000 tons in her bottom. This steamer was subsidised by the German Government, and had recently brought to Sydney 10,000 tons of sugar on which a bonus of something like £2 per ton had been paid. If that vessel were to bring over 20,000 tons it would be able to swamp the whole sugar of Queensland, and there is no reason why it could not be done. The only remedy against this very possible contingency is for the colonies to federate, and then the same thing could be done as was done in America. The United States said, "If you are going to send any subsidised sugar to this country we shall put a countervailing duty upon it." They did so, and at present the bounty-fed sugar is practically excluded. People talk of freetrade, but the bounty system is anything but fair, and I think we are quite justified in doing everything we can to put the sugar trade on a fair and equitable basis. With everything on an equal basis, I do not think the beet sugar could compete with us, and as a single colony we cannot stand against the present forms of competition. Put us together with the rest of Australia and we shall be able to do what was done in America. The point I wish to bring out, gentlemen, is that we shall never be able to have countervailing duties imposed in Australia unless we are united with the other colonies.

Mr. T. MACKAY (Cairns): I can fully endorse what Mr. Gibson has said on the importance of light lines, and may mention that we have these to Redlynch in our district. The Cairns Divisional Board borrowed £40,000 from the Government to build a railway, and at the start we were in doubt whether to build it on a 2-feet, a 2½-feet, or a 3-feet gauge, but Mr. G. Phillips, of Brisbane, our engineer, advised us to build it on a 3½-feet gauge, and we did so. When that line was building, I heard a carrier say the board had a great "cheek" incurring the expense they did, seeing that the traffic along the road which the line would follow was not able to support 2 carriers, and, for myself, when the railway was finished, I thought we would only be able to run trains two or three times a week. When we did start, however, we commenced by running twice a day, and the traffic had increased to such an extent that before 3 months had elapsed we found our rolling-stock was altogether insufficient for our requirements. The further increase of business necessitated further borrowing to purchase more rolling-stock, and we discovered that if we had put up a 2-feet gauge railway it would never have been able to cope with the traffic. The line is now paying, without any difficulty, interest and redemption, which amount to about 8 per cent. per annum, and the produce, moreover, is carried at a little less rate than on the Government lines. This line, which is certainly an object lesson to other districts, is at present 18 miles long, and we intend to extend it. As for federation, I think it will be to the benefit of all of us, and I can endorse everything Mr. Gibson has said on that subject.

Mr. W. TORT (Rockhampton): Some of the delegates have been practically saying that if we do not federate with the other colonies they will give us such a hot time of it with our sugar that the colony will be forced to join the union or else have her industries ruined. But what about our cattle, from which New South Wales has to draw her supplies, and what are

her people going to do for beef? We have a market in London and can ignore them altogether. This is a weapon in our hands quite equal to any in theirs.

Mr. A. C. WALKER (Knockroe): I am quite in accord with what Mr. Gibson says about the 12 months' agreements for kanakas. Many are in favour of the longer term, and many against it, but we in the South are suffering a good deal from "walk-about" boys, and at present you cannot get them to engage until just before crushing. I do not blame the boys, but a good deal of the trouble is brought about by some growers keeping their labour as short as possible and thinking they are saving money. They may be saving, but I do not think they are, for it is a poor farm that cannot keep its labour all the year through. I do not speak for myself, for I do not engage boys much except when there is a rush, but still tenant farmers are often to blame. One man gets his labour for 12 months for very little more than another does for 6 months, and he gets his work done much better. In other respects there is not the slightest doubt that the 12 months' agreements are better for both boys and employers.

Mr. W. THOMPSON (Childers): At present the boys will not engage until crushing time, when they know you cannot do without them, unless you try Hindoos, and the former are better than the latter. The boys do nothing but play cricket on the side of the road month after month, and if you ask them to go and engage they will tell you "by-and-by." This thing goes right on until the time when the growers want them, and then the boys do not know what they want. You make a verbal arrangement with them, but when you come to the point of engaging them somebody has seen them in the interval, and they demand something else. The storekeepers tell them to ask for 16s. or 17s. a week, and matters have now come to such a pass that you might just as well give them a white man's wage of £1. I think the kanakas ought to be made to go home or else re-engage. They go about the streets, sometimes getting trusted for their board and sometimes not, and I would like to see some regulation providing for a fixed amount of wages, say, 8s. or 9s. a week. I recently asked 3 of my boys if they would engage again, but they told me, as usual, they would see me about it "by-and-by."

Mr. R. GIBSON (Ayr): One of the principal requirements of the sugar industry in Queensland is more intense cultivation and also better methods, coupled with the assistance of a chemist; and as for federation, I believe that if we do enter into union with the other colonies that they will deal liberally with sugar.

Mr. C. J. BOOKER (Woolooga): The trouble among sugar-planters in connection with federation appears to be the fear of the probable loss of black labour, but Queensland has probably less to fear in this respect from the Federal Parliament than from her own. Where, but from the south, came the bulk of the capital that established the sugar industry in Queensland? The southern men are not going to lose their capital by interfering with our labour conditions. You can take a guide from the election of the federal delegates as to the future representatives and senators of the federation. The delegates were the big men of the south, and the future Australian legislators will be big men, many of them the financial directors of companies whose capital is now in the sugar industry.

Mr. J. E. LEASK (Bundaberg): The object to be arrived at is the cheapest way of producing sugar, and when we look at the average production of Queensland sugar as compared with that of other countries we find Queensland lowest on the list. It is certainly not because of the poorness of the land, but the cause is probably that we do not put it to such a high state of cultivation. This can only be done by securing highly competent chemists, and having our soils thoroughly analysed to see what is wanted to bring them to the highest state of efficiency, and I have much pleasure in supporting the arguments that have been brought forward in advocating the engagement of such chemists.

Mr. E. DENMAN (Mackay) : Great stress has been laid on the protection that would be given to the sugar industry by federation. At the present time sugar is protected in Queensland to the extent of £5 per ton, but this does not benefit the canegrower owing to the fact that we have to export, although if our production were only equal to our consumption, it would be a different matter. We shall very shortly have to export our sugar beyond Australia, and then the Australian protection would only affect us to the amount of sugar we are now making. As for the benefits of joining a powerful federation, the case of Canada might be instanced. Overtures were made over and over again to Canada to federate with the United States, and heavy tariffs were put on Canadian produce by the States in retaliation for her declining to join the Union. That did not injure Canada in any way, but compelled her, instead of sending her produce across the border to the States, to send it to England and elsewhere, and that is one of the chief secrets of the prosperity of the Dominion to-day. For myself, I do not think we are likely to be much benefited by federation.

Captain HENRY (Lucinda Point) : Before dealing with the matter of federation, I wish to enter my emphatic protest against the treatment accorded to the resolution at the conclusion of my paper. The Chairman said such resolutions were unusual at these conferences; but they are usual, and improper my resolution could not possibly be. It seems to me to be fatuous to prepare papers and read them, and have discussion invited, unless a consensus of opinion can be arrived at. That can only be done through the Resolutions Committee, which I respectfully submit is Mr. McLean's committee. Mr. McLean gets up at the commencement of every conference, and proposes that So-and-so and So-and-so shall constitute a Resolutions Committee. It is immediately put to the vote, and is carried unanimously. I maintain that such a committee is not representative of this Conference or of any other, nor do I see why the appointment of such a committee is necessary. If it is necessary, I cannot see why the committee should not be appointed by the Conference. I think if men are called together, invited to read papers and discuss them, that they must be surely empowered to move such resolutions as they may think fit, to be rejected or affirmed by the Conference as it thinks right. You were kind enough to listen very patiently to the short paper Mr. Black was good enough to read for me, and I shall not bother you with any recapitulation. I simply put it to you on behalf of the people who sent me here. Although the kanaka is a disappearing factor in cane cultivation in tropical Queensland, it is impossible, for the present at any rate, for the industry to be carried on without the assistance of black labour. I ask you to consider whether there is or is not a possible danger of black labour being taken away from us in the event of federation. If there is danger, it behoves us to consider whether the maintenance of a great industry, such as that of sugar, is not worth while considering before we take what is really, after all, a leap in the dark. I fully admit all the advantages of federation that have been so ably laid before you, so long as the sacrifices we are called upon to make, or risk making, are not too great. With regard to Mr. Booker's argument that we run a greater risk at the hands of our Queensland Parliament than at the hands of the Australian, I would like to remind him that the power of interference with our black labour lies, and will lie, under the Commonwealth Bill, with the Parliament in Brisbane. Whether that Parliament will be so constituted after federation as to be more favourable to the maintenance of the sugar industry than at present is an open question. I, myself, am inclined to be of the opinion of gentlemen who have spoken to me, and who know more about these matters than I do. In the event of federation a very large percentage of our leading men will go from the Parliament of Queensland into the Parliament of Australia, and, as a matter of necessity almost, I fear that the conduct of our local affairs may possibly fall into the hands of less able legislators than we have at present. I therefore ask you to consider where there is a possible danger of our labour being taken

away from us, which would mean the destruction of our industry in tropical Queensland, and to pause before you make a leap in the dark. It might not be out of place, whatever temporary check there might be to the course of federation in the event of Queensland holding back, to see whether the other colonies would not make that one little concession—that in the event of federation the labour question in Queensland shall not be interfered with, at all events for some time to come.

The Hon. J. V. CHATAWAY: In summing up the discussion on these papers, a discussion which has been limited owing to shortness of time, I should like to draw the attention of the Conference to the fact that in discussing bounties and countervailing duties they seem to have lost sight of the most striking case of countervailing duties, if such we may call them—namely, the action taken by Victoria to protect her interests in Queensland. Victoria imposed some years ago a duty on beet sugar, which was double that imposed on cane, which is a good deal more than a countervailing duty, and at the present day, while our sugars and Mauritius and Java sugars go into Melbourne paying £6 a ton duty, sugar from the Continent has to pay £12, which practically excludes it. That is the most striking successful instance of countervailing duties that I know of. The question that Captain Henry has raised about resolutions and the Resolutions Committee is not easy to deal with. The chairman of such conferences as these should, I think, take the general sense of the meetings, and, so far as lies in his power, carry out the wishes of the meeting. Last year they came to certain conclusions at Rockhampton, and it was evident that it was desired that some legislation should be introduced in connection with weigh-bridges. I introduced a measure on the lines suggested at the Conference, and it is now law. As for countervailing duties, since last Conference I have been in constant communication with Sir Horace Tozer, and I now receive a weekly letter from him on this subject, and as many of you are doubtless aware he has pushed himself to the very front of the anti-bounty agitation. He is now the most prominent man in the anti-bounty league, and there is no man within the last nine months who has done more in England towards getting the consummation of the wishes of the sugar-growers, and indeed of everybody, than Sir Horace Tozer. His speeches are admirable, and his mastery of facts and figures have attracted attention throughout all the financial circles in London. Time prevents me from saying anything further now on this subject, but I should like to mention to those delegates who are interested in the central sugar-mills, and in the details of sugar-growing, that they are invited to meet at the Prince of Wales Hotel this evening, at 7.30. Those members of the Conference who are specially interested in cattle inoculation and the tick question are invited to meet at the Good Templars' Hall, in Sydney street, for a discussion on those subjects. In each case such officers of the department as have special knowledge on these subjects will be present to give such assistance in their power as will throw light on the various matters. The discussion that now follows is: "How will the agricultural interests of Southern Queensland be affected by the adoption by the colony of the Commonwealth Bill?" I draw the attention of members to the limitation of the subject of discussion to the agricultural interests of Southern Queensland, and I define that expression to mean the interests of wheat-growers, potato and maize-growers, and those who are engaged strictly in agriculture of temperate districts as opposed to the tropical industry of sugar.

Mr. A. HUNTER (Laidley) then read the following paper entitled:—

HOW WILL THE AGRICULTURAL INTERESTS OF SOUTHERN QUEENSLAND BE AFFECTED BY THE ADOPTION BY THE COLONY OF THE COMMONWEALTH BILL?

The subject that the society which I represent wished me to have discussed through the medium of this Conference is—"How will the agricultural interests of Southern Queensland be affected by the adoption by the colony of the Commonwealth Bill?" As a farmer myself, of some years standing in the southern part of Queensland, I do not think that we have any cause to fear competition with the

southern colonies, as our principal productions are maize, hay, chaff, potatoes, wheat, butter, cheese, and bacon. The dairying industry, which is only young yet, comparatively speaking, is ever expanding by leaps and bounds, and is going to be a very important industry to the farmer of Southern Queensland, as our climate is such that we can grow fodder all the year round in the shape of greenstuff, which is so necessary in the dairying industry. Then we have pig-breeding, another industry in the South of this colony, the products of which we now export largely in the shape of bacon and hams to the southern colonies. It is feared by some that if we have federation and intercolonial freetrade the farmers of Southern Queensland will be utterly annihilated; but I do not think that such will be the case. I admit that in times of drought they will be able to take advantage of our free ports. But with anything like favourable seasons the farmers of Southern Queensland will have the markets of New South Wales and Victoria for their surplus maize, which is often almost a drug in our local markets. With regard to wheat, our local production is not nearly equal to home requirements as yet, but I believe that Queensland in the near future will be the greatest wheat-producing colony in Australia. We have not only got the Darling Downs, generally called the garden of Queensland, for the production of wheat, but the Burnett district also will eventually be a large producer of this cereal, and I am confident that a great portion of our Central district and those rich plains of our Western country are well adapted for the growth of wheat, as wheat does not require any great rainfall to bring it to perfection.

I believe that with such a beautiful supply of artesian water as we possess, and with a country naturally adapted for irrigation, wheat could be produced independent of any extra rainfall. Furthermore, I think that at no very distant period, instead of importing so much of this cereal as we do at present, we shall become exporters to a very large extent.

The sum of nearly all the arguments against federation is that the farmers of Queensland, as a body, are going to suffer, but I do not hold with this view of the case. With intercolonial freetrade and protection against the world, I think the farmers of Queensland will be quite able to hold their own. I believe that, with federation, trade and the various industries will be developed. Queensland is rich in all sorts of minerals—such as gold, copper, iron, and coal—and with protection against the world, capitalists will be induced to start the iron trade, which has done so much to enrich other parts of the world.

All our railway material, and machinery of all descriptions imported from the outside world, should, and will be, at no distant period, manufactured within our own borders; and, as a sequence, population will flock to our shores. Population means consumption, and consumption means a market for farmers. So that I think that, with federation on fair and reasonable lines, the farmers of Queensland, as a whole, have nothing to fear. It is argued by some that Queensland is too young for federation; but the same argument would hold good 20 years hence. It is also argued that New South Wales and Victoria will have too great a preponderance in the Federal Parliament according to the Commonwealth Bill, but we must remember that the Federal Parliament is not going to legislate for any one State more than another. That Parliament will be the Parliament of Australasia, and will legislate equitably for the benefit of the whole of the States. As a farmer of Southern Queensland, I would like to see the adoption of the Commonwealth Bill by the people, and federation consummated; to the end that we may become one people, and that Australasia may become an important factor in that great Empire of which we are all so proud to be a part, and on which we, as Britons, may well boast, the sun never sets.

Mr. W. D. LAMB (Yangan): When the Commonwealth Bill becomes law, I believe we shall be independent of southern competition, and, as an illustration of my meaning, I may mention the butter industry, which has now reached such a stage as to enable us to export as well as to supply our own requirements. As for wheat, our production will soon be overtaking our home demand, and the necessity for a duty on that product will be gone. At the same time, I think the imposition of duties to protect young industries is advantageous, and if the sugar industry had not had originally a protective duty of £5 per ton, I doubt whether it would have attained its present dimensions in Queensland. As a farmer I have not the slightest fear of federation, but I should like to see it held over for a few years until we are

altogether independent of the competition I have referred to. Federation would be beneficial with protection against the world, for at present we may be getting a fair price for a certain product, when news comes that there is a big shipment of Californian wheat or maize arrived in Sydney, and that has a bad effect on the markets in the other colonies.

Mr. K. W. SCHOLZ (Stanthorpe): I have had no instructions from my society on the subject of federation, but the feeling there is strongly in favour of it. We do not fear it, and living as we do, on the border, we know where the shoe pinches under the present condition of things.

Mr. E. HICKS (Southport): I am in favour of federation, and I am sure there is no Queensland farmer who is afraid of New South Wales competition, but with Sydney a free port, it is a dumping ground for produce from the rest of the world. The result is when prices go up in Queensland, there is always plenty of foreign produce on hand in Sydney to be sent up here to flood our markets.

Mr. C. F. M. FISCHER (Zillmere): From what I have heard, if the delegates to this Conference thoroughly represent the feelings of their various societies, the probable vote that will be taken in Queensland on federation will be a great eye-opener, for so far I have not heard any sentiment worth mentioning against federation. The people in the North appear to be on the horns of a dilemma, the fear of black labour being taken away from them and the hope of an increased market. In the South we have not the fear, but we have the prospect. Those who are interested in wheat and butter have no fear of federation, and have spoken in favour of it, and we who are interested in the fruit industry can say the same. We have nothing to fear from federation, and the consumer, who, after all, is the greatest factor in any community, will be benefited if any benefit is to be derived. That should be the great consideration in all questions of this kind, for we are naturally so constructed that we look upon everything from a selfish standpoint. There are several lines of industry in fruit-growing in Southern Queensland which I am sure will be benefited by federation. At the present time we have open markets for our green fruits in most of the southern colonies, but still there are some where duties are imposed, and on fruits which we can grow very readily, and for which we could get a market in the course of federation. Pine-growers in my district are specially interested in the canning industry, but they cannot dispose of their product in the southern markets owing to the duties imposed there on canned fruit. With federation, those duties would be removed, and I am sure the canning of pineapples in this colony would be revived. Pineapples are now canned here, and sent even to protective Germany and elsewhere, but, with the markets of Australia open to us, we would be able to can on our own farms, send the product all over Australia, and benefit not only ourselves, but those who would like to consume pines, and are not able to secure them in their natural state.

Mr. J. HUDSON (Rosewood): There is a good deal of sentiment in this federation business, and I think if the various speakers so far were divested of the amount of sentiment that is in them, there would not be much left. I am a Southern farmer, and have been farming in the South for thirty years. I have seen something during that time, and have experienced something. We have had protective duties in Queensland, and yet the markets of the south were open to our products in a free sort of way. Take farm produce. I have seen potatoes sold in the south at 30s. a ton. It is not 5 years since I sold lucerne chaff for 22s. 6d. a ton. Where were the southern markets for those things? They were shut up, and will be shut up again. I agree that the south cannot compete with us in fair seasons, but then we are most susceptible to seasons of drought, and I contend that 1 month of dry weather would do more harm to our crops than 3 months' drought would do in the south. At the present time prices are fair, and they are what the consumer is easily able to pay. We should not, however, like them to be lower, and if it were not for our protective duties we would not be getting half of what we now get. We

have a protective duty, but they have not. We, in the Southern part of Queensland, consume the sugar from the North, but I say the North does not consume our produce in like proportion, for, in spite of the protective duties, we still frequently hear in the papers of orders going to the southern colonies. I have nothing against federation on proper lines.

Mr. H. M. STEVENS (Rosewood): I am sorry to have to disagree with my colleague, Mr. Hudson, on the subject of federation, but at the same time I have no mandate from my society as to the opinion I should express here. I can merely express my own, and that is that I think that on the whole we have nothing to fear from federation. Perhaps in some lines we may go down, but on others we have a great advantage over the south owing to our earlier seasons and cheaper lands, and on the average I think we have the advantage. If one article of produce fails, we would have to take up others which we can produce to greater perfection than they can in the south. I have thought a good deal on the matter since it has been brought prominently before us, and on the whole I think it would really be more desirable for us to join in than to stand out of the union.

Mr. C. J. BOOKER (Woolooga, Wide Bay): Mr. Hudson was particularly anxious that federation should be approached without any sentiment. I am not with him in that, and when I contemplate that piece of cloth at the end of this hall, "Faith, Hope, and Charity," it reminds me that every Queenslander should have it for his motto—that is, faith in the country, hope for the future in what the country and he himself will be able to do, and charity towards his neighbours. I am a native of Queensland, a cattle-owner, a dairyman, and a farmer, and I really think I represent the interests the delegates here are representing. For myself I represent the three, but I know most about the cattle industry, and, touching upon that particularly, federation to the Queensland cattle-owners—the owners of something like 6,000,000 of cattle—will mean this so soon as the machinery of federation is established, and the disruption that federation will naturally bring about has subsided. I grant that in many of the industries there will be disruption, for on all occasions when there is a change of tariff, a few must suffer. But this will only be for a short time, and as soon as the machinery of the union is set going it will mean to the cattle-owners of Queensland £1 a head, or an increment of 6 millions of money to the wealth of the colony. At the present time if we federate, bullocks that are sold at Brisbane at £4 could be chilled at the works in Brisbane, and sold as chilled meat in Melbourne, where they would return to the cattle-owners of the southern districts, at the very lowest, allowing for the profits of the meat company and the middleman—without whom we cannot conduct our business—£5 10s. per head, and we must consider that while the producer is thus benefiting, so also are the storekeeper and the community generally. What really concerns the cattle-owners in that particular way, concerns the dairyman, for if the bullocks are enhanced in value to the extent of £1 10s. a head, so would the value of the cows that breed the steers be similarly increased, and in an all round sense federation means to every farmer, who is also a cattle-owner, a considerable balance on his credit side. It has pleased me immensely to-day to hear the southern delegates, with about but one exception, declare themselves federalists, because it will go forth throughout the country that a body of representative men from centres which federationists were afraid of, have shown themselves in favour of the movement by voicing to-day sentiments worthy of them, and of the country in which they live. (Applause.)

Mr. F. W. PEEK (Loganholme): I would like to ask, in the event of federation becoming an established fact, whether each State will have the power, in the interests of agriculture, to establish special regulations and laws, or practically a board of agriculture for its own particular interest in that State. Will they have that right, and is there any provision in the Bill for a Board of Agriculture, or for a Board of Trade? Although mining is particularly looked after in the Bill, agriculture is not considered.

The Hon. J. V. CHATAWAY: There is a provision in the Bill which precludes the granting of direct bounties to agricultural production, but there is nothing in the Bill preventing indirect assistance to agriculture, such as the establishment of colleges, experiment farms, &c., and the importation and distribution of new seeds. I should say that it is very probable that under the Bill there will be considerably less interference with the practices and laws of the various colonies, as they now exist, than is expected. It must be understood that there are only one or two matters which are exclusively handled by the Federal Government. In the rest of those numerous subjects in the 51st clause, the legislation of the States can be concurrent with that of the Federal Parliament, and unless it clashes with the Federal Parliament the legislation of the States will be operative and effective. I think I have explained what I mean, for I find that a number of people think that immediately we have federation and things are fixed up, the Federal Parliament will promptly undertake our business. I do not think that is the intention. We shall be left largely as we were in many things, and this answers Mr. Peek's question as to whether we shall be able to continue the same assistance to agriculture as we do now. We can do it in every way, except by direct bounties, although direct aid in a cash way is distinctly allowed to the mining industry.

Mr. F. W. PECK (Loganholme): I have not come here empowered by my Association to advocate or to speak against federation, and up to the time of my leaving my end of the country, the matter had not been discussed in a manner by which the farmers could understand it. I am not here to commit myself or my district in any shape or form, and I am not here to say I am representative of the opinion of the South, but I think somewhat better conditions could have been embodied in the Commonwealth Bill—for instance, in provisions for developing local industries which may be started in the colony as well as those which are at present in an embryo state, and which it would be an advantage to foster. Although I do not believe in State aid, still there are certain things which hang upon production which the State must necessarily foster for its future development. I was very pleased, in reading the *Mackay Mercury* this morning, to see it stated that the "Duke of Portland" was arriving with a number of immigrants for the shores of Queensland, and this I think is a step in the right direction, being only sorry that it has not been carried out for some years previous to this. We would have been in a better condition to compete in the southern markets if our lands had been more fully developed. As for the danger from the competition of our southern neighbours, I do not think there is any farmer in Queensland afraid to meet them on equal terms, but it is only by co-operation that we can do so, and with it we can compete with them to a certainty.

Mr. W. DEACON (Allora): I represent a wheat district which will perhaps be more affected by federation than any other. Our duty on wheat and flour will shortly be practically inoperative, for this season we shall produce 2,000,000 bushels, and I think by the time federation is actually in full operation we shall be exporting, the more so as it is only the Southern part of the colony that we are called upon to supply with wheat. We do not seem to be able to get at the North. As for Mr. Hudson's prices for chaff, I do not know where he got them from. I have got 3 boys working on their own account, and they are all going in for federation. I asked one of them the other day why, and he told me that he read the southern newspapers and saw that, on the whole, the prices for farm produce in Sydney and Melbourne were in advance of those procurable in Queensland, which would mean a better market for him. Figs worth 80s. in Queensland are worth £2 in Sydney. Chaff is worth £1 a ton more in the south than it is here. The assimilation of the railway tariffs would be a great advantage under federation. A few years ago some of our farmers grew barley and sent it south, but, owing to the duty of 2s. a bushel there, the venture was unremunerative; but federation would prevent a repetition of that. The farmers in the southern colonies at present have advantages over ours in the matter of Customs duties. In the first place, there is a duty of £2 a ton

on galvanised iron in Queensland, but down south there is none, and on kerosene, which farmers use a great deal, we have to pay 6d. a gallon duty, while the New South Wales farmer pays nothing. We pay 6d. per lb. on our tea, but in New South Wales it is 1d., and in the other colonies 3d. Tobacco is more highly taxed in Queensland than in the south. Canada is always mentioned in federation discussions, and it may be stated that the farmers there are in an extremely prosperous condition.

Mr. L. P. LANDSBERG (Rockhampton): I am a federationist, but I am a separationist first, and I think if we wait we shall be able to federate on better lines than this Commonwealth Bill gives us. This Bill has been a great improvement on the others, and I think it is still open to further improvement. As for the charity referred to by Mr. Booker, I do not think we Central Queenslanders have got much charity from our Southern neighbours, and under federation we should be ruined by the Southern part of Queensland. As for "Hope," what we are all hoping for is separation, and for the rest of Mr. Booker's motto we have great faith in the future prospects of Central Queensland.

Mr. C. ATTHOW (Brisbane): As mottoes are in fashion, and a great many appear to be sitting on a rail, I may quote "Now or Never." Why to-morrow? The sooner federation comes the better it will be. Take maize: I do not see how it can be affected. Mr. Hudson evidently expects that in dry seasons he would not get the high prices under federation that he otherwise would, but why should the cabmen and draymen pay an abnormal price for their horse feed when it can be got cheaply next door? Maize would merely find its level. You may remember that when the duty was put on maize, Sydney retaliated, and the whole of the country to the north of Sydney was lost to our maize-growers on the Downs. Previous to the imposition of the duty, the complaint in New South Wales was that thousands of bushels of Queensland maize were sent across the border, but now this market has been lost. As for other forms of produce, in most cases the crops do not come at the same time. Again, our growers are heavily oppressed by the duty on potatoes. Hundreds of tons have to be imported for seed, and 15s. a ton has to be paid on them, and the remission of this duty alone would counteract many of the alleged disadvantages of federation even if they did occur. In the comparison of our imports of wheat from, and our exports of cattle to, New South Wales, the balance is greatly in our favour, and if we take fruit we find we export ten times more than we import. The greatest quantity of our imported fruit comes from Tasmania, from which we get our seed potatoes, and there is also there a great opening for bacon, butter, and cheese. Mutton and beef were worth from 7d. to 9d. per lb. the last time I was down there. Although we have an open market in the south for bananas and pineapples, yet there is a heavy duty on oranges, which hampers the Maryborough man greatly, and we are almost excluded from the Adelaide and Tasmanian markets because of the heavy duties, which federation would remove. Labour is essential to the advancement of agriculture in the colony, but an argument against immigration is, that the people will only go away to the other colonies after they have been assisted to Queensland. In Brisbane you can get neither boys nor girls at present, and the farmers are crying out for labour, but they will only get it under federation. When we consider that we have the raw material and the southern colonies the population, federation cannot be anything but a tremendous benefit to us.

Mr. G. MUNTZ (Mosman): As for the maize market under federation, that some of the South Queensland farmers are afraid of, it should be remembered that the Queensland farmer can get 2 crops of this cereal in a year as compared with the one in Victoria, and in the latter colony, on some farms, it is often impossible to get maize. As for oranges, ours will reach Melbourne before the local ones are ready.

Mr. T. F. STUBBIN (Boonah): At the beginning of last year I was selling my maize in Brisbane at 4s. 9d. per bushel. It then came down to 4s. 6d., and afterwards to 4s. 3d., but reading in a Melbourne paper, I saw it quoted at 7s., and as there is a duty of 2s. 3d. a bushel on maize in Victoria, this made

a difference of 6d. a bushel in the Brisbane and Melbourne prices. Sydney is generally receiving a lot of maize from America, which floods New South Wales and brings down also the Queensland prices, and, altogether, I cannot see that the protective duties on maize are much good to us. I have sent maize to Brisbane and got 4s. 1d. for it, whereas if I had sold it at Ipswich it would have fetched 4s. 4d. We have to import our seed potatoes, and I got 12 tons the other day upon which I had to pay £8 duty, which is certainly a big tax on potato-growing. Federation will open up markets for us in the south, and I cannot see how it will do otherwise than benefit us.

Mr. T. S. BEATTY (Collaroy): A position that we may take up is, that if we do not join the union now we shall be shut out, and we are such large exporters that we cannot afford to be so treated. If Queensland does not join the other colonies there is no doubt that she will suffer enormously, for we must have markets within our reach for our perishable produce, that is, produce that will not carry a long distance. Many gentlemen who have spoken have confined themselves to the particular product they produce, and that is very natural, because we are making a living out of the soil, and we each want to know what federation will do for us. There is another aspect to federation. It means that the accumulated wealth of the south will come, and must come, to develop the soil in Queensland. It must come, for the accumulated wealth must find investment, and we are the best colony in Australia for the purpose. We have our mines and our lands that will produce the finest of wool. We have cattle that are asked for everywhere, and we do not know what to do with them. If we send them to Victoria they charge us 30s. a head, and we have produced to such an extent that we cannot get rid of them ourselves. Therefore, we must federate to extend our markets, and union with the other colonies will also mean that they will come and invest their savings with us.

Mr. S. E. TOOTH (Pialba): I do not claim to represent the ideas of the district I come from, for we have never particularly discussed federation there, but for myself I intend to vote for it. Not being interested in the sugar industry, I cannot say how it will affect it, but for dairying and fruitgrowing I do not think these two industries, will be injured by federation. We hear on ever side that the southern farmers will dump their produce into Queensland, but we can do the same to them. We already send our fruit south, and the demand for it is so great that men are sent up from Sydney and Melbourne to buy it off the trees. We also send a good deal of butter south, and about 12 months ago, when there was a drought in Victoria, they consumed there a lot of Queensland butter, so that I think, if anything, dairying will greatly benefit from federation.

Mr. E. N. ROGERS (Rockhampton): I have heard a good many arguments to-day, but I cannot say I have heard a single one in favour of federation proper. All the arguments have been in favour of intercolonial freetrade, but it does not necessarily follow that this is federation at all, for federation means a great many things besides, some of which I personally object to. As far as intercolonial freetrade goes, everyone seems to be anxious for it, but that can be secured without any cumbersome machinery. We are already federated, and we have a body called the Federal Council which has power to legislate. If any colony wants to enter into freetrade with another, it can do so provided the majorities of the people so desire. I believe that is a fact. Intercolonial freetrade evidently means protection against the world, and as far as Queensland is concerned, I believe a market for a good many of our products can be found in Japan and other Eastern countries. There is an immense market there, and I must leave it to the consideration of cattle men how protection against the world will affect them. I think before our farmers and agriculturists vote for the Bill, they should try and get a little more information about its other aspects, and I hope their representatives in Parliament will give them that information, for the more important aspects of the Commonwealth Bill appear to be at the present time almost entirely ignored. I am not going to sit on the

rail myself, but I believe in the Federal Council, and consider it the germ by which we might arrive at federation eventually. I do not believe in elaborate Constitutions, and consider we have quite enough of them in Australia already.

Mr. WILLIAM BEALE (Childers): I cannot bring a single argument to my mind opposed to federation. So far as I understand agriculture, it is the root and branch of any country, and the moment you get a wealthy agricultural population you have a wealthy country. With federation, I understand that a certain amount of competition would come from the south, but with our cheaper lands and earlier seasons I think we would be more than able to compete with southern farmers, while on the other hand they would be more than likely to be able to supply us with what we particularly want in the shape of good agricultural labour. At present the men who come from the south to the Isis district are about the most reliable, respectable, and energetic we can get.

Mr. R. J. BLAKE (Blenheim): I have had about 30 years' colonial experience, and, looking back, remember when I landed in the country the talk of separation from the other colonies had not died out. The talk of the old hands then was that they would now be able to build up a country for themselves and a home for their families owing to this separation. Now, if it was desirable then to have separation from the other colonies on the grounds that this colony had not equal representation, I think it is just as needful for us now to remain as we are rather than become united with the other colonies. Mr. Deacon stated that his sons were in favour of federation, but I have 9, and they are all against it. Queensland is my home, and I have great faith in its future, and I intend to do all I can to prevent federation ever taking place. The majority of the delegates here who have spoken in favour of federation are in good positions, and will be able to compete against the southern colonies, but I hold that the small farmer is not in a position, and will not be able to do so.

Mr. R. S. AIKEN (Gooburrum, Bundaberg): In order to bring the discussion to a head, I beg to move the following resolution:—"That in the opinion of this Conference it will be to the interests of the agriculturists of Southern Queensland if the colony of Queensland adopts the present Commonwealth Bill."

Mr. W. BEALE (Childers) seconded the motion.

The Hon. J. V. CHATAWAY: Although the motion is not altogether regular, it seems to be the desire of the meeting that we should deal with it, and I shall accordingly put it, but before doing so would like to say a few words on what has been said. I may say that I entirely agree with Mr. Rogers in his statement that what has been discussed to-day has rather been intercolonial freetrade than the Commonwealth Bill, and I am sorry the time limit prevented him from somewhat expanding his remarks on that subject. There was a West Australian Minister the other day who said that, as he represented the agriculturists, he was against federation whatever the rest of his colleagues in the Cabinet thought. I think, myself, that any Minister for Agriculture should try as far as possible to represent the feelings of the agriculturists in whom he is, and must be if he is a good Minister, personally interested. Your discussions here to-day will go a good way towards guiding the Queensland Minister for Agriculture in the views and position which he will take up on the federation question. It is impossible for anyone to blink the fact that the large number of delegates here from the Southern part of the colony, with but few exceptions, are in favour of the Commonwealth Bill, so far as they understand it. There are many other parts of the Bill which have been in no way discussed at all. Probably they have made up their mind that the expense and cost of a Federal Government and of the machinery that will be brought into play by that Federal Government are so insignificant that the cost is not to be allowed for a moment to weigh against the advantages of intercolonial freetrade. Some speakers have said that if we did not go into the Federation we should probably be made to go into it by the discriminating duties and discriminating legislation against us. I cannot agree with that for a moment. Queensland is not such a small colony; it is not so unprosperous or insolvent that it can be cajoled or coerced into federation by any

other set of colonies. If we are to go into it, it will be because it suits the Empire and because it suits ourselves. The point has been raised that the North of Queensland does not deal with the South to the extent it might, and that orders go past Brisbane to Sydney. This was true years ago, but every year the North is more and more dealing with the South. Although the North does not buy as much as it will eventually when the Southern people have learned to put up their goods in a more attractive form and more suitable to the Northern buyer, yet year by year there is more and more bought from the South. As for the fear of the Southern farmer voiced to-day in regard to maize, I can assure you that, if labour is withdrawn from sugar and the sugar industry ceases, there will be no maize grown in Queensland except in the North. Where the North of Queensland is compelled to grow maize, there the average product of the land is more than double that of any other part of Australia. It may be interesting to Southern farmers to know that if we cease to grow sugar the Northern maize-grower would very soon knock the Southern out of the market. I shall now put Mr. Aiken's motion.

Mr. W. THOMPSON (Childers): I think that every man here only votes for himself, as that I think is all he can do, and not for his district.

The motion on being put was carried, 26 voting for it and 11 against.

RESOLUTIONS AND REPORTS.

The next business was the adoption of a report from the committee elected at the Agricultural Conference in 1898 at Rockhampton to deal with the system of the marketing and the distribution of farmers' products, and which read:—"We, the committee appointed at the Rockhampton Conference, beg to report that after correspondence with members, we have arrived at the decision that in order to ensure success, it is necessary for the various districts represented at this Conference of 1899 to lay the matter before their respective associations on the following lines:—(1.) Co-operation for marketing and distribution, which includes exporting and importing. (2.) To also consider a scheme for obtaining monetary assistance that would be on co-operative lines. (3.) That this Conference re-appoint a committee to further correspond, with a view of preparing a practical scheme furthering the above objects."

Upon the foregoing being adopted, Dr. THOMATIS moved, and Mr. W. TORT seconded—"That the following gentlemen constitute a committee to carry out the suggestions contained in the report:—Messrs. W. D. Lamb, C. F. M. Fischer, E. Swayne, F. W. Peek, W. Thompson, J. E. Noakes, J. Crook, K. W. Scholz, W. R. Robinson, M. O'Keefe, and D. Thomatis."—Carried.

Mr. PEEK then moved the adoption of the report of the Resolutions Committee on the paper on proposed dairying legislation by Mr. Rogers, which read:—"We, the Resolutions Committee, suggest to the favourable consideration of the Government the urgent necessity of passing such extended legislation dealing with dairies as to registration and inspection in the interests of public health and in the interests of the people of this colony."—Carried.

On the motion of Dr. THOMATIS, a hearty vote of thanks was accorded to the mayor and citizens of Mackay for their kindness to delegates during their stay in the town.

Mr. R. S. AIKEN (Gooburrum): I beg to move a hearty vote of thanks to the Hon. J. V. Chataway for the manner in which he has conducted the business of this Conference. We all know it is very difficult to manage a number of farmers, for it seems to me we can hardly agree on any two subjects, but there is not the slightest doubt that Mr. Chataway has had all our meetings very well in hand.

Mr. W. GIBSON (Bingera): I beg to second the motion. This is the first of these Conferences that I have attended, and I have been delighted with it.

Mr. C. J. BOOKER (Woolooga): I have much pleasure in supporting the motion, and, in doing so, would like to draw attention to the particularly able way in which the Chairman has summed up the various papers and discussions.

The remarks that have fallen from him have been most instructive, and this leads me up to a matter which I would like to have ventilated. These Conferences, properly speaking, are intended to be educational, as are also the papers that are read. A gentleman takes up a certain subject, upon which he writes a paper, but unfortunately a good deal of extraneous matter crops up into it which can hardly be called educational by any stretch of imagination. It is discursive, and takes up a lot of time that expunges from the business of the Conference most important educational matters. There are several questions that were to have been brought up whose position has been forced out by foreign matter. I do not think I am in a position to move a motion, but I would suggest that for any future Conferences the papers that are to be read by delegates be submitted to their respective societies, previous to being presented at the Conference, in time to be thoroughly considered, and sent to the Agricultural Department to be printed in sufficient numbers for distribution to each of the delegates. When that paper is read, we have the gist of it, and are better able to debate it. Instead of a man having to get up and speak *impromptu*, he would have the opportunity of studying the subject, and any remarks that might fall from him would be of educational value to people who had not the practical experience that that man had had, and these Conferences would be considerably more productive of good. I own, with the greatest of pleasure, to have derived a great deal of instruction by my presence here, but I feel that if the system suggested had been carried out I should have gone home infinitely better informed, and would have derived during my stay here infinitely greater pleasure. I understand those at the head of affairs are only too anxious to do anything to further improve the Conferences, and I think the suggestion thrown out is quite feasible.

Mr. AIKEN's motion was then carried with acclamation.

The Hon. J. V. CHATAWAY: I am much obliged to you, gentlemen, for your vigorous display of pleasure. It is not altogether a sinecure to preside at these meetings, because you are obliged to cut things short, and the chairman cannot be too polite. What Mr. Booker suggests is what we have aimed at, and what we have been utterly unable to accomplish. The suggestion is all right; and when people are really anxious to come to these Conferences and take a pride in being nominated by their associations, we shall be able to get the papers in time so that they may be printed and distributed to delegates. But at the present we cannot get the associations to nominate their representatives even in decent time. Members are here now whose names arrived too late to be printed on the programme, and when we are unable to get the names it is even more impossible to get the papers submitted and selected. As Mr. Booker says, there is a good deal of extraneous matters in the papers, and, as you are aware, we have been forced to add two more sessions to our original programme.

Mr. P. McLEAN: I would just like to put myself right with regard to Captain Henry's remarks. I have had a good deal of experience in conferences, and knew what the probable result would be without a Resolutions Committee. Somebody had to take the initiative, and, in putting my motion, the object was simply to secure results from the Conference. I am not on the committee myself, and, so far as I could, I proposed gentlemen to sit on it representative of the various industries here represented.

This concluded the regular business of the Conference, but on Thursday evening the representatives from the various sugar districts had a meeting at the Prince of Wales Hotel, at which the central sugar-mills and cognate matters were discussed at length. On the same evening at the Good Templars' Hall, most of the rest of the delegates attended a meeting on the tick question, Mr. P. McLean being in the chair. Messrs. T. S. Beatty, H. Cattermull, L. P. Landsberg, C. J. Booker, and Bridgman gave a number of valuable and interesting facts in connection with their practical experience with the tick, on the conclusion of which Dr. S. Hunt, the Government Pathologist, answered at length a large sheaf of questions handed in to him in writing by delegates present.

TRIP TO MIRANI, &c.

On Friday, 30th June, at the invitation of the Minister for Agriculture, the delegates journeyed to Eton and Mirani by rail, stopping, among other places, at Mr. Bridgman's and the Victoria Meatworks. At the latter place, dinner was provided; and after the toast of the Queen had been honoured, Mr. F. W. PEEK, in a neat speech, proposed the health of the Minister for Agriculture.

The Hon. J. V. CHATAWAY, in reply, said: Our time is short, but I should be lacking in courtesy if I did not acknowledge the kindness I have received throughout the Conference, and again to-day, from the delegates. The success of these Conferences, as I had occasion to remind you last year, is by no means entirely due to the Minister. It is largely due to those experts by whom he is accompanied, and who have, as I know they have, the good of the Department and the good of the agricultural interest of Queensland at heart. These gentlemen are always ready at all times to give information, and to advance, as far as lies in their power, the agricultural and pastoral industries of Queensland. The most satisfactory part of this Conference to myself, having, as I have, the interests of the Department at heart, was the unstinted praise at one time or another during the Conference that was bestowed on the Department. I say this because it is no credit to myself, for while the Minister is an ephemeral creature, here to-day and away to-morrow, the Department goes on like a running river, whatever Minister presides over it. It was therefore with the greatest pleasure that I heard, as the different subjects came up for discussion, one after another, delegates rise from their place on the floor of the conference hall and give praise to the Department for various actions it had taken. One delegate said he had made a start with some wheat obtained from the Department; another, when the discussion on citrus fruits was on, said that his neighbour had told him that the fumigation done by the Department had been so eminently successful that he intended to buy a plant himself to continue the operation. Another man says he finds cow pea excellent not only as a green manure but as a food for men and stock, and that he got his first seed from the Department, which imported it. Another says the advice given by the coffee expert, who does not happen to be here, has been all that could be desired, and that he has put us in the way of making a fortune out of a plant that was formerly little grown in Queensland. All this is most satisfactory, and it shows that the Department is on the right course. It makes me hope that there will be instilled into the experts of the Department a certain feeling of *esprit de corps* (I call them "experts" for want of a better name—perhaps technical advisers would be more suitable), a feeling in the Department itself that each technical adviser is working not only for his own glorification but rather for the good of the Department and the glory of the agricultural interest in Queensland. We were in somewhat of a difficulty to-day to know how to entertain the delegates and show them over the land. Accommodation at any ordinary house or hotel would have been too small to hold such a number as we have, and in my difficulty the Meatworks came to my rescue. It is about the third time the Meatworks have done this for me, and it is through their kindness that we are here to-day. They have helped us to make a very pleasant day, and I think we may very properly thank them. You are aware that there is now being held in London an exhibition called the Earl's Court or Greater Britain Exhibition, the mining section of the Queensland court of which was, of course, committed to the Geological Department under Mr. Jack. The rest of the court, something like 10,000 feet of space, was committed to the Agricultural Department; and although we only had a very short time at our command in which to prepare an exhibit worthy of the colony, I am glad to say that the various meat companies, sugar companies, wool and wheat growers of the colony came to our rescue, so that we were enabled to make a display which, I believe, is worthy of any country in the Empire. I have a telegram saying that on a certain date 100,000 people passed through the

gates, nearly all of whom visited the Queensland court; that the greatest interest was manifested, and many inquiries made; that the wheat, sugar, and meat trophies were greatly admired; and that the statement was volunteered to Mr. Courtenay Luck, who is representing the Department, that the court was the finest display ever made in London. The message adds—and this is why I introduced the subject of the telegram—that the Mackay Meat Company's tongues were greatly admired by Messrs. Spiers and Pond—about the biggest of English caterers—who say that a good business could be done with them if the matter were followed up. You yourselves saw the exhibit made by the Mackay Meat Company in the local show here yesterday, and many pronounced it a very fine display. It is most satisfactory to know, from a local point of view, that the stuff put up in the tins here—which we believe to be as good as any that can be put up, and which we believe superior to that from most other works—has received such recognition in England. I need not say that I am extremely pleased that so many of the delegates have seen their way to come up to-day with me. It is a great compliment to the Minister and to the officers of the Department. I think that I should not be in order in sitting down unless I proposed a toast, and, under those circumstances, I ask you to fill your glasses. The toast I propose is, "Success to the Department of Agriculture," and with that I couple the names of the hard-working officers of that Department who are now present. I can testify myself—although some of the public may perchance scoff, and ask what is the good of this expense—that those officers put their whole souls into their work; that they devote an immense amount of time to it—not the ordinary from 9 in the morning till 4 in the afternoon, but night work, and such time as any ordinary man can devote work to the progress and pushing on of the Department. The Under Secretary, whom you all know, and whom you have all come in contact with, is an exceedingly hard-working man. One of my friends says he is a giant for work. He has his whole heart in it, and I think I can do no better than conclude by asking you to drink the health of the Department of Agriculture and its technical advisers, coupled with the name of the Under Secretary.

The toast having been drunk,—

Mr. P. McLEAN said: The Minister has referred to me in very kind and flattering terms, and when it is so satisfactory to Mr. Chataway to know the progress the Department has made, and the appreciation that those engaged in the agricultural industry now hold its operations, I may say it is more satisfactory still to me, the more so when I look back 12 years ago, when I undertook the formation of that Department in 2 little rooms in the Lands Office, with the sum of £1,800 at my disposal to carry on the operations of the Department, and look at its present state with a fine building in Brisbane, and to know that during the last financial year something like £75,000 was placed by Parliament at its disposal. It is also extremely satisfactory to me, as head of the Department, to know that we have now, with the one solitary exception of Mr. Pound, the whole of the officers of the Department under one roof, and it is not necessary now for those visiting Brisbane to run hither and thither to get advice from the Department's officers, for they can now all be found in the same building. The success of these Conferences is also gratifying, and I happen to know that it is impossible for us to gauge the results that follow from such meetings as we have just held. I hear of them not only in our own towns, but I hear of them from all parts of the world, for, as you are aware, our literature circulates wherever the British tongue is spoken. I hope, as we have gone on from success to success, that we may continue on the same lines, to which there can be only one result, and that is benefit to what is going to be the gigantic industry of this colony of Queensland.

Mr. JOHN MAHON (Agricultural College): I rise, as one of the oldest officers of the Agricultural Department, to thank our chief for the kindly manner in which he has spoken of us. We should all feel very proud indeed

to know that the Minister appreciates our work, and in our Minister and our Under Secretary we have two gentlemen whom the smallest boy in the office can approach at any time and discuss matters with them, whereas in some cases in Government offices they work quite differently. I know for a fact in many of the Government offices in the southern colonies the officials or experts of the Department are unable to see their Minister except once or twice a year. He is, therefore, unable to get the strength of them, but both our Minister and Under Secretary are in close contact with us every week, and I am quite satisfied that if we neglected our duties we would be quickly sent about our business. I have been connected with the Department for 10 years, and during that time I can safely say every officer in connection with it has been a really hardworking man—men who are prepared to take off their coats and do their work, and not only tell you how to do it but teach you the practical part of it. You are aware that at the present time I am at the head of one of the most important institutions in the colony, the Agricultural College, and with the permission of my chief I shall be very pleased to see any of you there. You should come and see what we are doing, and I am quite satisfied you would be delighted with our work. If you send your sons to it they will get a thorough practical training, and will receive care quite equal to any bestowed by yourselves, if not more, for we are not only responsible to the Department, but also to the parents of the students. I think I cannot better conclude than by thanking the people of Mackay, especially the ladies, for the courtesy and kindness extended to us all while in this city.

Mr. G. A. WAITE (Proserpine): I beg to propose the health of the Mayor and the citizens of Mackay. We have been most hospitably received here, and I hope no toast will afford us more pleasure than the one I have proposed.

The toast was drunk with cheers.

The MAYOR OF MACKAY (Mr. S. Lambert): I am proud to occupy the position that I do in this town, and I feel the position more this week than I have ever done since I occupied it. I can assure you that I feel grateful to the inhabitants of Mackay in every sphere of life for the manner in which they have contributed to your enjoyment, and I should have thought them not loyal to our worthy representative, the Hon. J. V. Chataway, had they not done so. I think, gentlemen, that he has conferred a great honour on his constituency by having this Conference held here, and I do not know of anything that could have been brought about that will bring us more before the different towns and districts of the colony than a conference of this kind. I hope that it is not for any hospitality that you may have received that you will remember us, but that the discussions that you have had, the insight you have had into our industries, and the nature of our climate and productions may be such that you will carry away with you a fair idea of our requirements, and that you will co-operate with us in carrying out our industries to more advantage than we have hitherto been able to do. We have in times gone by received a certain amount of opposition in connection with our labour—the kind of labour which is absolutely necessary for our farmers to employ if they are to grow cane profitably, and as you know cane is our only staple product here. I have been a resident of the Mackay district for a good many years, and I can assure you that I am speaking the truth when I say that if the farmers could have a sufficient quantity of suitable labour for their industry there would be ten times more work for the white population, and better wages. Before sitting down there is one thing I would like to say, and that is, that I am very sorry indeed that the Minister for Railways did not accompany you, for we were looking forward to his being one of the party to this Conference. Mr. Chataway tells me he will be here next week, and I hope he will, for in that particular department I think we have been rather neglected—that is, so far as railway construction is concerned. We were given to understand that Mr. Murray was to have been here this month, and we have been able to scrape up a very fair order for him. However, I can assure you that we have thoroughly made up our minds that we are going to have railways if possible, and it is not going

to be for want of asking for them. We have been neglected in the matter of railways for a long time, and the time has come when every citizen in the district is going to put his shoulder to the wheel to try and insist on additional railway construction. I heard one or two discussions at the Conference, and on the question of cheap money for farmers, for instance, I was surprised to hear so many ideas. Some wanted cheap money, but others said cheap money was a bad thing. Some said they wanted reliable money, and that it did not matter so much about the price so long as it was reliable, and others again wanted it both cheap and reliable. I can tell you this, and I am speaking now from experience, I have no desire for the State to assist me in my business, and I believe in a man helping himself, but I consider the Government is in a better position to borrow money than individuals, and I go so far as to say that the Government being in that position should borrow money to be at the disposal of *bond fide* farmers. But I say, advance it through the present institutions, and advance it to those farmers to help them along who can give undoubted security, and only to those people who would devote it to agricultural purposes. I do not believe in bolstering up industries at Government expense, but what we want is men with capital, and if you are going to bolster up a man who has not sixpence of his own, to my mind you are keeping capital away. I think if the Government were to pay more attention to extending railways they would confer a greater boon, and they would by that means extend this colony far more rapidly than they are doing. I take it that we have any amount of land that is only waiting to get within a reasonable distance of a market to be taken up, and I believe it would be beneficial to the Government and to the colony at large. I thank you most heartily for drinking the health of Mackay and district, and I can assure you that Mackay is only too pleased to see you all enjoying yourselves, and to have the good wishes you have given. (Applause.)

This concluded the dinner, and, an adjournment being made to the train, further points of interest along the line were visited, the party finally returning to town about 6 in the afternoon. After tea, the committee appointed at the Agricultural Conference to consider and report on the schemes for agricultural credit and banking, drawn up by Messrs. Thomatis and Peek, held a meeting in the Britannia Hall; Messrs. Peek, Fischer, Lamb, Thompson, Crooks, Scholz, Swayne, and Thomatis being present. The other members of the committee who were not present are Messrs. R. Gibson, Noakes, W. R. Robinson, and O'Keefe. Mr. Peek was moved to the chair. Mr. D. Thomatis was appointed secretary and correspondent. The schemes of Messrs. Thomatis and Peek were laid on the table and discussed, the debate resulting in a majority of the committee deciding to postpone Mr. Peek's scheme until that of Mr. Thomatis was dealt with. Mr. Thomatis, at the request of the committee, traversed his scheme; questions were asked and answered to the satisfaction of the committee. One of the questions concerned the practicability of issuing agricultural bank-notes, and that subject Mr. Thomatis also explained satisfactorily. It was finally decided that the secretary (Mr. Thomatis) write to New Zealand, Victoria, and other colonies, requesting that copies of agricultural credit schemes in operation might be forwarded. The *modus operandi* was decided on as follows:—The secretary to collect information and evidence, and transmit the same to the committee, who will then call meetings in the several districts they represent. The data will thereafter be discussed in each district association, the results of the discussion being transmitted to the secretary, who will arrange the various results into a report which will be sent to each member of the committee. On the united action of the committee thereafter, appeal will be made to Government if the conclusions favour such a course. On the following day, at the invitation of the Homebush branch of the Pioneer River Farmers' Association, the delegates visited that district, inspecting among other things the famous mill of the Colonial Sugar Refining Company. This and similar excursions occupied the time of delegates until the last had left for home.

Dairying.

THE COLLEGE HERD.

LAST month we published the results obtained from some of the dairy herd at the Queensland Agricultural College, Gatton. These returns, having created much interest amongst dairy farmers, will henceforth be published every month in the *Journal*.

RETURNS FROM COLLEGE HERD, FROM 1ST MAY TO 31ST MAY, 1899.

| Name of Cow. | Breed. | Date of Calving. | Yield in Pounds. | Per cent. Butter Fat, Babcock Test. | Commercial Butter. Lb. |
|------------------|------------------------|------------------|------------------|-------------------------------------|------------------------|
| Rosebud | Ayrshire | 13 April, 1899 | 483 | 3.9 | 21.097 |
| Blink | " | 23 April | 846 | 3.9 | 36.94 |
| Laverock | " | 20 Sept., 1898 | 348 | 3.4 | 13.251 |
| Ream | " | 16 Aug. " | 285 | 3.5 | 11.172 |
| Sasome | " | 12 Aug. " | 462 | 3.7 | 19.145 |
| Dairymaid | Holstein | 27 Feb., 1899 | 353 | 3.0 | 11.86 |
| Opale | Jersey | 24 Feb. " | 459 | 4.2 | 21.591 |
| Playful | " | 15 Jan. " | 469 | 4.0 | 21.011 |
| Eileen | " | 1 Aug., 1898 | 311 | 4.4 | 15.326 |
| Effe | " | 10 Feb., 1899 | 437 | 4.0 | 19.579 |
| Connie | " | 18 Nov., 1898 | 364 | 4.1 | 16.714 |
| Scarlet | South Coast | 17 Sept. " | 435 | 3.7 | 20.098 |
| Toughy | " | 16 Nov. " | 432 | 3.8 | 18.385 |
| Plum | " | 6 Dec. " | 301 | 3.4 | 11.462 |
| Dolly | " | 17 Oct. " | 275 | 3.6 | 11.088 |
| Misery | " | 4 May, 1899 | 550 | 3.0 | 18.48 |
| Broad | Devon | 15 Oct., 1898 | 347 | 4.0 | 15.545 |
| Rosie | " | 5 Oct. " | 330 | 3.8 | 14.046 |
| Pansy | " | 17 Oct. " | 346 | 3.9 | 15.113 |
| Nestor | Shorthorn | 27 Feb., 1899 | 566 | 3.5 | 22.187 |
| Hilda | " | 1 Mar. " | 440 | 3.6 | 17.74 |
| Plover | " | 25 April | 632 | 3.7 | 26.19 |
| Queenie | " | 20 April | 575 | 3.6 | 23.184 |
| Maggie | " | 5 April | 308 | 3.4 | 11.728 |
| Leopard | Grade | 23 Nov., 1898 | 440 | 3.5 | 17.248 |
| Restless | " | 7 Oct. " | 365 | 3.9 | 15.943 |
| Star | " | 17 Dec. " | 602 | 3.6 | 24.272 |
| Daisy | " | 11 Nov. " | 359 | 3.8 | 15.279 |
| Ourly | " | 9 Nov. " | 410 | 3.6 | 16.531 |
| Rose | " | 11 Feb., 1899 | 647 | 3.5 | 25.362 |
| Poll | " | — Oct., 1898 | 449 | 3.7 | 18.606 |
| Princess | Grade Shorthorn | — Oct. " | 576 | 3.7 | 23.869 |
| Laurel | " " | — Sept. " | 514 | 3.8 | 21.875 |
| Patch | " " | — Sept. " | 366 | 3.5 | 14.347 |
| Beauty | " " | 1 Oct. " | 381 | 3.3 | 14.081 |
| Ginger | Grade | 23 Oct. " | 398 | 3.4 | 15.155 |
| Sally | " | 9 Nov. " | 412 | 3.5 | 16.15 |
| Jess | " | 15 Nov. " | 282 | 3.6 | 11.36 |
| Rusty | " | — Oct. " | 442 | 3.9 | 19.306 |
| Podge | " | — Oct. " | 376 | 4.1 | 17.265 |
| Peggy | " | 15 Nov. " | 370 | 3.6 | 14.918 |
| Bally | Grade Hereford | 9 Nov. " | 382 | 3.2 | 13.69 |
| Lady | Grade Shorthorn | 6 April, 1899 | 677 | 3.7 | 28.054 |
| Trial | " " | — Sept., 1898 | 432 | 3.9 | 18.869 |
| Duchess | " " | — Oct. " | 405 | 3.9 | 17.69 |
| Jane | " " | — Oct. " | 389 | 3.8 | 16.555 |
| Lucy | " " | — Oct. " | 386 | 3.5 | 15.03 |
| Rosella | " " | — Oct. " | 353 | 3.7 | 14.628 |
| Whitefoot | " " | — Oct. " | 333 | 3.9 | 14.545 |
| Nell | " " | 12 Oct. " | 246 | 3.3 | 9.092 |
| Redmond | " " | — Oct. " | 333 | 3.8 | 14.172 |
| Biddy | " " | 18 May, 1899 | 317 | 3.9 | 13.84 |
| Fancy | South Coast | 17 May " | 348 | 4.1 | 15.97 |

Mr. Mahon draws attention to the fact that many of the above animals have been a long time in milk, and are now being dried off.

The Markets.

AVERAGE PRICES FOR JUNE.

| Article. | | | | | | | | JUNE. | | |
|---------------------|-----|-----|-----|-----|-----|-----|-------|-------------|----|-----|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bacon | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7 |
| Bran | ... | ... | ... | ... | ... | ... | ton | 5 | 9 | 6 |
| Butter, First | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 10½ |
| Butter, Second | ... | ... | ... | ... | ... | ... | " | 0 | 0 | 7½ |
| Chaff, Mixed | ... | ... | ... | ... | ... | ... | ton | 4 | 1 | 0 |
| Chaff, Oaten | ... | ... | ... | ... | ... | ... | " | 4 | 10 | 0 |
| Chaff, Lucerne | ... | ... | ... | ... | ... | ... | " | 4 | 12 | 0 |
| Chaff, Wheaten | ... | ... | ... | ... | ... | ... | " | 2 | 19 | 0 |
| Cheese | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7½ |
| Flour | ... | ... | ... | ... | ... | ... | ton | 8 | 5 | 0 |
| Hay, Oaten | ... | ... | ... | ... | ... | ... | " | 3 | 18 | 0 |
| Hay, Lucerne | ... | ... | ... | ... | ... | ... | " | 3 | 13 | 0 |
| Honey | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 2 |
| Japanese Rice, Bond | ... | ... | ... | ... | ... | ... | ton | 12 | 18 | 0 |
| Maize | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 7½ |
| Oats | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 3 |
| Pollard | ... | ... | ... | ... | ... | ... | ton | 5 | 10 | 0 |
| Potatoes | ... | ... | ... | ... | ... | ... | " | 4 | 2 | 0 |
| Potatoes, Sweet | ... | ... | ... | ... | ... | ... | " | 1 | 18 | 6 |
| Pumpkins, Table | ... | ... | ... | ... | ... | ... | " | 2 | 0 | 0 |
| Sugar, White | ... | ... | ... | ... | ... | ... | " | 14 | 10 | 0 |
| Sugar, Yellow | ... | ... | ... | ... | ... | ... | " | 12 | 6 | 0 |
| Sugar, Ration | ... | ... | ... | ... | ... | ... | " | 9 | 14 | 0 |
| Wheat | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 4½ |
| Onions | ... | ... | ... | ... | ... | ... | cwt. | 0 | 6 | 4½ |
| Hams | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 9½ |
| Eggs | ... | ... | ... | ... | ... | ... | doz. | 0 | 1 | 3½ |
| Fowls | ... | ... | ... | ... | ... | ... | pair | 0 | 4 | 1½ |
| Geese | ... | ... | ... | ... | ... | ... | " | 0 | 5 | 4½ |
| Ducks, English | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 6 |
| Ducks, Muscovy | ... | ... | ... | ... | ... | ... | " | 0 | 4 | 8½ |
| Turkeys, Hens | ... | ... | ... | ... | ... | ... | " | 0 | 6 | 0 |
| Turkeys, Gobblers | ... | ... | ... | ... | ... | ... | " | 0 | 12 | 5 |

ENOGGERA SALES.

| Article. | | | | | | | | JUNE. | | |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-------------|----|-----|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bullocks | ... | ... | ... | ... | ... | ... | ... | 5 | 4 | 6 |
| Cows | ... | ... | ... | ... | ... | ... | ... | 3 | 9 | 0 |
| Wethers, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 7½ |
| Ewes, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 7 | 11½ |
| Wethers, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 12 | 5 |
| Ewes, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 0 |
| Lambs | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 2 |
| Baconers | ... | ... | ... | ... | ... | ... | ... | 2 | 7 | 6 |
| Porkers | ... | ... | ... | ... | ... | ... | ... | 1 | 8 | 0 |
| Slips | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 2½ |

Orchard Notes for August.

By ALBERT H. BENSON.

THE planting of deciduous trees should be completed by the end of this month in all parts of the colony, but evergreen trees can be transplanted during seasonable moist weather at any time of the year if the operation is carefully carried out. When set out, the young trees must be cut hard back to a height that in no case should exceed 2 feet from the ground, and in warm dry districts half of this height is to be preferred. Cutting back at planting insures a strong and vigorous young growth, whereas by neglecting to cut hard back at planting the future growth, vigour, and symmetry of the tree are greatly impaired if not completely spoilt. The pruning of all deciduous trees must also have been completed; and all citrus fruit trees from which the fruits have or should have been gathered should be gone over carefully, all dead and badly diseased wood should be removed, and any crossing or superfluous branches, or water sprouts, should be cut away. When the trees are badly attacked by scales this pruning should be severe, in order that the remedies used for dealing with these pests may have a fair chance, as when the top of a citrus tree is allowed to grow like a mat it is impossible to get the spraying material use on to the parts where it is most wanted. Spraying should be systematically carried out in every orchard in the colony during this and the preceding month, and in the case of fungus diseases on deciduous trees during the following month as well. Spraying is just as essential an operation as the gathering of the fruit; and no fruit-grower who wishes to make fruit-growing a success can afford to neglect it, as it is impossible to breed disease in fruit trees and to grow fruit profitably at one and the same time. A full description of the operation of spraying and of the most approved remedies was published some months ago in pamphlet form by the Department of Agriculture, so that any grower who has not received a copy and who desires to obtain the necessary information may obtain it by writing to the Department. After pruning and spraying, the orchard should be ploughed; so that all weeds and trash can be buried, and also that the land that has been trodden down firm shall be broken up. Use a short American plough that will take a wide furrow and turn it right over. The depth at which to plough will depend on the treatment the orchard has previously received and on the nature of the soil. If the soil is shallow, or if the land has never been worked, then the ploughing must be shallow or the roots will be badly injured; but where there is plenty of soil and a perfect sub-drainage, then the ploughing can be from 4 to 6 inches in depth (provided the land has been previously cultivated) without any injury to the trees. In fact, in such soil surface roots are not required, and the trees stand dry weather best when deeply rooted. Grape vines attacked with black spot, where they have not been dressed with sulphate of iron previously, should be treated during the earlier part of the month; and this treatment should be followed in the earlier parts of the colony with a spray of Bordeaux mixture towards the end of the month or just before the buds burst into leaf.

Quick-acting artificial manures, such as sulphate of ammonia, sulphate of potash, or superphosphate, can be applied during the month, but care should be taken not to apply too large a quantity at once, as owing to their extreme solubility a considerable portion of them is apt to be washed out and lost by heavy rains. In conclusion, one more word about spraying, and that is: Do your utmost to stamp out diseases in new districts as soon as ever they make their appearance. Do not consider any disease too trivial, and that it can be well let alone to a more convenient time, as the more convenient time will not

come; but the disease will flourish and spread rapidly, so that what might have been checked, if not eradicated by half-an-hour's work will now take the grower all he knows to get the better of it. In spraying, whether for insects or fungi, a knowledge of the pests to be treated, combined with carefulness and promptitude, are the essentials of success.

In notes of this kind it is impossible that they can apply equally to every part of the colony, but they will be found to be about an average. Very early districts will sometimes require the notes of a month later, and very late districts those of a month earlier; but this will right itself when a year's notes have been written.

Farm and Garden Notes for August.

Farm.—Now is the time for busy work in the field, work which will produce rich results at harvest time. An early crop of maize may be planted. Potatoes should be planted as soon as possible. Plant only such potatoes as have sprouted. This means an earlier and even crop than if the unshot seed is put in. In selecting maize seed choose large, flat grain. From experiments made in Europe and America, it has been shown that by constant selection of seed from prolific plants, as many as 5 and 6 full cobs have eventually been produced on each stalk all over a field. This is worth trying. Sow pumpkins, either amongst the maize or separately. Arrowroot, ginger, and sugar may be planted. Swede turnips, clover, and lucerne may be sown, but they will have to contend with the weeds which now will begin to assert themselves vigorously. Therefore, keep the cultivator and hoe going constantly. Sow tobacco during this month. In tropical parts of the colony the sugar-crushing season should be in full swing. The remarkable frosts of last month have hastened the cane harvest, and the mills, in many cases running day and night, have successfully coped with much of the damaged cane. Rice and coffee should all have been harvested by now; but picking of Liberian coffee commences now. This being a dry month (in the North) little can be done in the way of planting. Plough out old canes and prepare the land for replanting.

Kitchen Garden.—This should be a busy month in the kitchen garden, as nearly all spring and summer crops can now be put in. Sow carrots, parsnips, beet, lettuce, French beans, runner beans of all kinds, peas, parsley, tomato, squash, cucumber, melon, pumpkin, sweet corn, egg plant, &c. Get all potatoes planted as soon as possible. Set out towards the end of the month tomatoes, melons, cucumbers, &c., which have been raised under shelter. The young plants should be protected from the sun for a day or two by means of a few twigs or other shading materials. Attend to the thinning of such crops as require it, as carrots, parsnips, turnips, beet, &c. Set out any cabbage plants which are ready. Peas should be supported where necessary by sticks or wire netting. Jerusalem artichokes may now be planted, also Globe artichokes. Weeds will now begin to grow in abundance, so the cultivator and hoe must be kept going among all growing crops. As the cabbage and cauliflower beds become finished, have them ploughed or dug up, and if possible allow the soil to be exposed to the air for a month or two before putting another crop in it. Pinch tops off broad beans when they come into flower, to make them set. See that cabbage, &c., do not become checked by want of water in dry weather.

Horticultural Notes.

By PHILIP MAC MAHON,
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THESE notes will reach the most distant recipient of the *Journal* about the second week in August, and must consequently be written with a view to their being helpful to him when he receives them, and to furnish him with food for reflection and hints for guidance until the *Journal* comes to hand again about the middle of September.

Queensland is a somewhat large place. There are a good many kingdoms, several of which could be accommodated side by side within its borders, and its climate, rainfall, and general climatic conditions vary very much in different parts, and the impossibility, at least so far as we know at present, of forecasting what the conditions will be a month in advance, must be taken into account by the reader.

At Brisbane, during a period of 38 years, 7 days in August have been wet on an average, and on these 7 days 2·63 inches of rain have fallen. In September there have been 9 wet days on an average, but only 2·07 inches of rain have fallen. September is our driest month, and August the next driest. But sometimes August is a distinctly wet month, as in 1879, when we had 14·67 inches of rain, and in 1887, when we had 11·80 inches. The mean shade temperature at Brisbane is 60 degrees Fahr. for August, and 66 degrees Fahr. for September. It is found here that with the awakening of spring there is a rush of work in every direction, and, as these notes are being written, time is being taken by the forelock, so as to get as far as possible all preparations made for the busy time coming.

The preparation of lawns may be continued into August, though we are busy in the Botanic Gardens at that kind of work now, because in a short time we shall not be able to reach upon it. There was a very deserted piece of land here, having an area of about 4 acres. The soil was of the most unpromising description, and it had never been cultivated. As it was a distinct eyesore, it was decided to bring it under cultivation, and it was ploughed and cross-ploughed several times, to bring the surface into workable condition and to break up, as far as practicable, the clay which was to be found immediately beneath. Then it was once again ploughed as deeply as possible, and a really excellent little plough called into requisition. This is called "Avery's Hard-pan Subsoil Plough," one of the cheapest and most efficient implements of its kind the writer is acquainted with. This was worked with 4 horses, though it looks as if very little would break it, so light and handy is it. The surface was then repeatedly harrowed, and thrown into a series of picturesque undulations by means of another American appliance, the "Columbia Shovel Scoop," which, with 1 horse and 2 men, did in a short time the work of many men. The surface was then raked over, and a wet day was waited for. When the surface of the ground was considered neither too wet nor too dry, the implement before recommended in the *Journal*, called the "Avery Garden Plough," was fitted with a small branch of bamboo to mark the distance of the rows apart. Then the plough attachment, before described in the *Journal*, was put on, and a drill made along the depressions in the land. Meanwhile buffalo-grass had been cut up roughly into small pieces, having roots attached, and a man followed the small plough laying in these cuttings, while another came after with a rake, quickly drawing the soil to the roots, the whole operation being performed very speedily. As one row was finished another was drilled at the distance indicated by the bamboo marker, and in this way all the portion of the land exposed to the wash of rains was soon planted with the buffalo-grass.

The more raised portions it was decided to cover with couch-grass (*Cynodon dactylon*), and a piece of sandy ground where this grows very freely was stripped. A chopper in the shape of the letter S was made of steel by the blacksmith; a floor was made of three planks; the couch-grass was thrown upon this, very quickly cut up by a man, put into sacks, taken to the ground, and sown broadcast over the surface, which immediately prior to the sowing had been harrowed to allow the roots to find a hold in the earth. The whole was then rolled. As most of the work was done to a great extent by machinery, it was not a very formidable matter, and the appearance of the ground even now is so much improved as to be worth the trouble.

Before this ground had been cultivated in the way above described, it would have been necessary to employ a pick to penetrate 6 inches into it. But the writer has thrust his walking cane into it at random since cultivation to a depth of from 1 foot 6 inches to 2 feet, in the presence of several readers of the *Journal*. When the weather gets warmer, say towards the middle of September, especially if there is a reasonable prospect of being able to obtain a sufficiency of water, we may begin to plant out tropical plants, especially the large variety of tropical flowering and foliage plants which lend to Queensland gardens a beauty not rivalled elsewhere in the colonies.

Ferrieres will require overhauling, top-dressing with a mixture of sandy loam and leaf-mould, staking up of some plants, and thinning out of others. Emancipate yourself from the common method of tying up such plants by gathering them into a wisp, and making what should be a thing of beauty into a hideous besom-like burlesque of a plant. A plant when tied up should look just as if the stakes had been there to begin with, and the plant had taken advantage of their presence to support itself. In this matter, as in all gardening, "art should conceal art."

Your roses will all have been pruned by the time these lines reach you, but take a look at them every now and again, and encourage them in the way they should go by rubbing off here and there a shoot with a tendency to grow in and crowd the centre of the bush, or as a fine young shoot begins to grow ahead, you can cut off the hide-bound branch which it is replacing. Let this process be gradual, and you will find that when pruning time comes you will have no need to hack your pets about. This kind of pruning may be adopted very largely with all classes of plants.

A table of the months is appended, showing temperature, rainfall, corresponding months in Europe, &c. You will find this useful. It may be mentioned that the Australian Spring commences on 23rd September at 4 p.m.

| — | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|--------|------|--------|-------|------|--------|------|------|--------|-------|------|--------|
| No. of Wet Days (average of 38 years) | 14 | 15 | 17 | 14 | 10 | 8 | 8 | 7 | 9 | 10 | 10 | 12 |
| Mean Rainfall (average of 38 years), inches | 7.10 | 7.69 | 6.56 | 4.44 | 2.94 | 3.7 | 2.59 | 2.83 | 2.07 | 3.00 | 3.86 | 5.14 |
| Mean Shade Temperature, degrees | 76 | 75 | 73 | 70 | 61 | 60 | 58 | 60 | 66 | 71 | 75 | 73 |
| Highest Temperature (typical year 1896) | 94 | 90 | 88 | *95 | 86 | 78 | 79 | 79 | 84 | 87 | 83 | 91 |
| Lowest Temperature (typical year 1896) | 63 | 65 | 57 | 54 | 47 | 38 | 33 | 36 | 38 | 47 | 54 | 58 |
| Seasons | Summer | | Autumn | | | Winter | | | Spring | | | Summer |
| Corresponding Months in Europe | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May | June |

* Taken on an abnormally hot day in this month in 1896. The average is 89.

Plate CXXIV.



"BRAESIDE,"
The Residence of the Honourable WILLIAM ALLAN, M.L.C.

Agriculture.

THE CULTIVATION OF BROOM CORN.

No. 3.

By DANIEL JONES,
Department of Agriculture.

BENDING.

THE operation of bending the broom-head is, with some varieties, a very necessary part of the cultivation, in order to avert that serious imperfection, the bane of the manufacturer as well as of the grower—namely, crooked brush. Prospective growers will have noted, in the last article on this subject, the illustration showing the difference between the perfect and imperfect brush. In practice, it will be found impossible to avoid having some small quantity of broom-heads taking the crooked form. Nevertheless, by timely attention to bending, the amount of loss from this cause need be trifling.

The period when this operation is necessary will depend very much on the condition of the crop. Should the crop have developed unevenly, some heads being more advanced than others, this will involve more attention, and resolves itself into a matter of expediency as to whether it will pay to begin bending, when only a part of the crop is sufficiently advanced to need that attention, or to postpone the work until the general condition of the crop demands it.

It must be borne in mind that the object of bending is to prevent the immature broom-heads from becoming contorted at the base, which usually happens either owing to the increasing weight of seed or to the tenacity of the sheath, which unduly constricts and so obstructs regular development. I find that in some seasons this trouble is more pronounced than in others, and is more common with certain varieties.

In some seasons, and with particular kinds, this operation was scarcely needed, for comparatively few heads would turn crooked at the base. A good deal also depends on the luxuriance of the crop, and, in the event of the heads being heavy and large, the need for bending will be early apparent. The period for turning down the heads is about the time when the seed is formed in the panicles, before they are quite full or have become matured. The bending, if properly performed, will not interfere with the head maturing, and will have the effect of straightening out the fibre, making it somewhat tougher and of more value from a manufacturer's point of view; and it also simplifies, to a material extent, the operation of cutting and curing.

In the event of prolonged wet weather at harvesting time, the turned-down heads will not deteriorate from want of cutting and exposure to the same extent as those remaining untreated. It rests with the individual grower to judge, from the evidence of the condition of his crop, as to whether this work is to be performed or not. The grower must bear in mind that this crooked brush, if produced, will materially lower the value of the sample in the buyer's estimation, as it is an article that can only be profitably used for one purpose in the manufacture of brooms. Hence factory proprietors look askance at a disproportionate quantity of crooked hurl or brush among their consignments.

The process of bending is accomplished by the workman moving down between two drills and gripping the stalk between finger and thumb, giving it a very firm pinch so as not to snap off the broom-head. Then, with a deft motion of the hand, he turns the stalk down. The precise knack of doing this operation,

so as not to snap off the top, cannot, of course, be indicated here, but a little practice will soon enable the operator to make just the grip and turn of hand essential to quick work. Sometimes the stalk is so tough that, by simply pulling the top over the elbow, the bending can be successfully done. I have found that unless care is exercised, more especially if the stalk is somewhat immature, the top, instead of bending over properly, will snap off to the detriment of the immature fibre.

When working among tall corn, it will be necessary to take precautions not to turn the tops down so that the fibre will come in contact with or too near the ground, in which event, on the occurrence of wet weather, the brush will be injured from contact with the soil. In turning down dwarf stalks, care must be taken that there be left a full 6 inches or 8 inches clear of the butt of the broom-head. In bending, it must be remembered that a clear, uninjured stalk is required of about 6 inches in length. I have known some new growers not only lose the weight in their crop by cutting close to the fibre, but, by this operation, rendering the product of less use and value to the broom-maker. The grower will, by experience, find how far this operation of bending is necessary. In most instances it will be found that a considerable number of the stalks will need no attention; hence, in such a case, the grower can pass over his crop very quickly. I would like growers here to give heed to a phase of the industry not hitherto dealt with, and, perhaps, this had better be referred to in this place, as it will of necessity have some bearing on the manipulation of crop at the time of maturity. I allude to the question of the best fibre. It is generally conceded by growers and manufacturers alike, that the best fibre is that which is cut before the seed is formed, as at that stage the hurl has not become brittle and stained. The question for the grower to determine then is, whether he can afford to discard the value of his seed for a more enhanced price for his fibre, avoiding, to some extent, the need of bending with a slightly increased trouble in cleaning fibre, or, on the other hand, sacrifice a certain proportion of fibre to save the seed. A very great proportion of the American crop is gathered before the seed forms, and the fibre brings, on this account, a high price, owing to its uniform colour and improved quality. These are matters for the farmer to deal with as his own interests dictate. I am aware that some growers could ill afford to dispense with the seed. These will adopt the more common plan of getting some seed as well as fibre, and be content to accept a somewhat lower price for the crop of broom-heads.

ABOUT MUSHROOMS.

By HENRY A. TARDENT,
Manager, Biggenden Experiment Farm.

IN Australia, poisoning from eating mushrooms is, I believe, a very rare occurrence. I do not know whether it is because there are not so many poisonous varieties in the colony, or because mushrooms are less used as an esculent. I find in a recent number of the "*Bibl. Univ. et Révue Suisse*" an interesting article written by Mr. A. de Zaczewsky, one of the greatest living authorities on mycology. As it contains many facts on the subject which may be of use here, I extract from it the following:—

"From the most ancient times mushrooms have been considered as an extremely healthy esculent. Modern science has confirmed that opinion. According to analysis made by the greatest authorities known to chemical science, mushrooms are by far the most nutritious of vegetable substances, not excluding bread. The proportion of protein they contain brings them nearer to meat than to plants. In addition, they contain an important proportion of assimilable phosphorus."

In Paris alone over £1,500 worth of mushrooms are being sold *daily*. In Italy and Germany, they form an important part of the alimentation of the people. For Russia there are no available statistics, but the writer of these lines can affirm, with Mr. de Zaczewsky, that in certain localities the people live nearly exclusively on mushrooms, especially at the time of the heaviest outdoor work.

The only drawbacks to the use of mushrooms are the cases of poisoning which occur nearly every year. According to Mr. de Zaczewsky, there are absolutely no empiric means of ascertaining the true nature of mushrooms. Neither the shape, nor the colour, nor the smell or flavour can be taken as a sure indication. Of course it is pure superstition to believe with some ignorant people that those mushrooms are poisonous which grow near a snake-hole, or close to a rusty nail, a mouldy piece of cloth, or a poisonous plant. Neither is it true that we can eat safely mushrooms which have been gnawed by insects. There are snails and insects capable of eating with impunity mushrooms which are highly poisonous to man. Even cows can eat varieties which it would not be safe for man to touch. But dogs, cats, and rats are affected similarly to human beings, and we can safely try on them suspicious varieties. Another groundless prejudice is to believe that if a silver coin or spoon or an onion become blackened by being put in the water in which mushrooms have been boiled, it is a sign of poison. It is not a poisonous substance which thus darkens those objects, but the presence of sulphur, which combines with other elements, forming thus sulphydric acid. Onions or silver boiled with eggs will become dark, too. Still, nobody would say that it is because eggs are poisonous.

As to the effects produced on our system by poisonous mushrooms, they are of two kinds. Some varieties, as the *Russules*, act directly on the digestive organs, causing there an acute inflammation ordinarily from two to three hours after they have been eaten. These are very seldom fatal. An emetic such as ipecacuanha or, still better, 15 grammes of emetic mixed with 30 grammes of sulphate of soda in a glass of water, to be taken in two draughts at intervals of five minutes, will be sufficient to free the stomach and save the patient.

Other varieties, such as some of the *Amanitæ*, are far more dangerous. Their poisonous principle is a narcotic, acting, not on the digestive organs, but directly on the nervous system. The effect takes place from six to forty-eight hours after eating the mushrooms, when the poison has all passed into the blood. It first causes headache, confusion of ideas, dejection, and stupor. Then follow nausea, vomiting, palpitations, acute abdominal pains, oppression, and intense thirst. The face is pale and panged; convulsions, delirium, and fantastic visions bring the patient into a comatous state. That condition, which is accompanied by intense pains all over the body, may continue for many days. But the result is nearly always fatal. Large draughts of strong tea or coffee are used to counteract the prostration. When the stomach is entirely free from the poisonous substance, then use ether and ammonia to prevent nervous accidents. Should the patient recover, he remains for a long time very weak, and the greatest care and precautions are to be used during his convalescence.

Such a terrible possibility as the above described should, it seems, be sufficient to deter anyone from eating mushrooms. Fortunately there is, according to Mr. de Zaczewsky, a perfectly safe means of eating with impunity even the most poisonous of mushrooms. It was discovered many years ago by Mr. Gerard, assistant botanist of the Jardin des Plantes in Paris. In the presence of a commission appointed for the purpose by the Academie des Sciences, he ate, and every member of his family did the same, some of the most poisonous varieties. The experiment was so conclusive that the members of the commission joined in the feast, and enjoyed with impunity some of the deadliest varieties of the *Amanitæ* :—

The recipe is simplicity itself. Copy it, and paste it in a conspicuous place :—

For every pound of mushrooms cut into pieces, take 1 quart of water, add to it 2 or 3 spoonfuls of vinegar or of salt. Soak the mushrooms in this for two hours. Then strain off the water and throw it away, as it contains all the

poisonous principle of the mushrooms. Rinse the mushrooms well, and boil in water for a quarter of an hour. Wash again in hot water, and prepare in the usual way, either by frying in butter or by making ketchup, soups, &c.

In this country the only mushroom I have seen used for culinary purposes is the white *Agaricus campestris*, so often found in the outskirts of our bush townships or in old sheep and horse camping-places. A still better way to secure a sure supply would be to buy spawn bricks from any reliable seedsman, and to grow them in the simple manner already described in this *Journal*.

MARKET GARDENING.

No. 7.

By H. W. GORRIE,
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ONIONS.

THE Onion (*Allium cepa*) is supposed to be a native of Central Asia, but its history is lost in remote ages, and it was probably grown before the earliest historical records.

On the great Pyramid of Cheops, which is supposed to have been begun 4,000 years B.C., is an inscription stating that 1,600 talents had been paid for onions and garlic supplied to the workmen.

Many drawings of onions are found on ancient Egyptian monuments, which fact seems to indicate that this vegetable was held in high esteem by these people. Onion-growing is one of the best paying branches of agriculture, provided the grower is thoroughly acquainted with the requirements of the crop, and knows exactly how to treat it.

The great item in the production of an onion crop is well-directed and skilful labour, by which a limited area of ground is worked to the highest pitch of skill, and is made to yield a crop in proportion to the work expended on it. Onions can be grown in a good many different kinds of soil, but to ensure the highest results, and the best possible crops, the selection and preparation of the soil become matters requiring considerable knowledge and forethought.

The very best kind of soil on which to grow good crops of good onions is a rich sandy loam, or good alluvial soil with a fair proportion of sand in it.

Such soil as this, if well drained and otherwise in good condition, will grow good onion crops. Next in importance to the right kind of soil is the condition of the soil as to cleanliness.

It must be free as far as possible from all weeds, and seeds of weeds. It costs more to grow a crop of onions on land full of weed-seeds than the crop is worth; so the ground must be thoroughly cleaned before the seed is sown.

New land, provided it can be worked fine enough, is usually the best. Ground which is not very bad with weeds may be cleaned to a great extent by ploughing it up some time previous to planting, and allowing the weeds to germinate, and then destroying them with the cultivator. If this is done and the land ploughed again, it will be comparatively clean.

Ground which is very bad with weeds had better be let alone, so far as onion-growing is concerned. What is needed for successful onion culture is rich, clean soil, well drained, free of stones, as free as possible from weeds, and capable of being worked to a very fine tilth.

If the soil is not naturally rich in humus, it should be heavily dressed with well-rotted manure which has no long straw in it and not too many seeds of weeds. About 40 tons of this to the acre will not be too much. Spread it over the land, and plough it well in. After ploughing, the harrow and roller must be used until the ground is reduced to a very fine tilth. It must be thoroughly pulverised before planting, and it is quite impossible to get it too fine. The preparation of the soil is really the most important part of the whole business, and too much care cannot be bestowed on it.

Now there are two ways of planting onions. One is to sow the seed in the rows in which the plant is to grow permanently; and the other is to sow in seed beds, and afterwards transplant to the permanent ground. Each of these systems has its advocates; and as there is a good deal to be said for both, it may not be amiss to describe both methods.

First, let us take the old style of sowing right away in the field. Get good seed to begin with—new seed for choice, because old seed loses a good deal of its germinating power, and in onion-growing much depends upon the quality of the seed.* Four pounds of seed to the acre will be ample.

The usual time of sowing here is in March and April; and the seed may be sown in either of those months as soon as the ground is ready, and while it is yet moist on the surface. The ground should be first marked out in perfectly straight rows from 2 to 3 feet apart. If the sowing is to be done by hand, shallow drills not more than $\frac{1}{2}$ -inch deep should be made, the seed sown thinly and evenly, the drill filled in and raked over, and the ground afterwards rolled. To sow a large area, hand work is too slow and expensive; and a Planet Jr. seed drill should be used, which opens the drill, sows the seed, covers it and rolls it, and at the same time marks the line for the next drill.

Now, the great thing in onion-growing, as I have already stated, is to keep the ground clear of weeds. If they are once allowed to get ahead of the crop, it is an almost hopeless business to try to get rid of them. As soon as ever the onions appear above ground, so that the rows can be distinguished, the hoe must be set to work. The best implement to use is a wheel hoe, which can be worked on both sides of a row at once, and gets over the ground at a surprisingly quick pace. This implement, in careful hands, will clean the ground to within half-an-inch of the plants on each side, and the rest of the work must be done by hand. An old table knife or a piece of hoop iron with a wooden handle is very useful for cleaning among the young plants, and, if the weeding is done thoroughly the first time, it will be an easy matter to keep the ground clean afterwards. But understand: This weeding has got to be done, and done thoroughly, or your crop will be a failure.

The weeds must be tackled as soon as they appear, and the fight with them must go on until they are thoroughly under command. The onions will probably require thinning when 4 or 5 inches high.

From this point, the work, under both the old and new systems of onion culture, becomes the same; so we will now describe the second method of planting.

Under this system, the seed, instead of being sown in the field, is started in a seed bed, in drills a few inches apart. When 6 inches high, the plants are taken up and transplanted to the field, which has been previously prepared in precisely the same way as for sowing. The young plants, as they are taken from the seed bed, are trimmed root and top with a knife to make them strong and sturdy, and cause them to develop fresh roots. They are then planted with a dibber, about 3 inches apart in the rows. The plants must not be set too deeply in the ground—only just enough to keep them firm. Only the root and about $\frac{1}{2}$ -inch of the bulb should be in the ground.

The advantages of this system are that the plants, being 6 inches high when set out, have a long start of the weeds, and consequently are easier to keep clean; also, transplanted onions usually make much larger bulbs than those sown and grown in the same place.

The old method is much easier to begin with as far as the planting is concerned, but this is made up for in the weeding, and the onions do not grow so large. As, however, in this country, large onions do not seem to be much in favour, this may not be much of a disadvantage. In any case the grower must be prepared for a backache which he will not forget for a time. He will get this in weeding by the old system, and in transplanting by the new.

* Of 20 lb. of seed imported from Germany, packed in bags, we failed to raise a single plant; yet the seed was fresh when shipped.—Ed. Q.A.J.

Personally, all things being considered, I prefer transplanting, if labour is available to do the work, more skill being, of course, required for planting than for weeding.

When the weeds are well under command, and the onions have got ahead of them, not much is necessary, except to give an occasional stir to the soil by the cultivator.

When the onions are ripe, choose a dry day and pull them out, laying them in rows in such a way that the bulbs will be partially shaded from the sun by the tops. This is done by laying one row down, and covering the bulbs with the tops of the next row. Next day you can cart them in when dry, and spread them out on a barn or shed floor or any place you can use, provided it is dry and has a free circulation of air. In a few weeks the tops will wither, when they can be twisted off, and the onions graded and sent to market.

In growing pickling onions, of course the seed is sown direct into the ground and very thick—at the rate of from 25 lb. to 30 lb. per acre. The subsequent cultivation is just the same as in the case of the large varieties. One acre of good onions will realise more than a good many acres of ordinary farm crops. Ten tons is not an uncommon yield per acre, and the price is seldom below £6 per ton. Good varieties to grow here are Brown Spanish, Yellow Globe, and James' Keeping. Brown Spanish (which is advertised in America as Brown Australian) is a general favourite among onion-growers because of its hardiness and good keeping qualities.

THE VALUE OF STRAW.

FARMERS who live in grain-growing districts and have plenty of straw do not value it as they should, or give it the care it deserves. Instead of keeping it under cover or even stacking it carefully, it is simply threshed on a heap in the field and allowed to rot there. If one is not provided with a barn or shed in which to store it, it can be so stacked that the loss will be small. The main point to be observed in stacking is to keep the middle high and well tramped; then when it settles the outside will all slope downward, and the stack will not take water. If well topped, with hangers-on to prevent the wind blowing the top off, it will keep in good shape an entire year. By cutting down the stack in sections and using an entire section before beginning another, very little need be wasted. It is not nearly so convenient, however, as when stored in the same building where used. Much of the most valuable portion of the chaff is wasted when stacked outside.

Good straw ranks higher in feeding value than most farmers are inclined to admit. They seldom feed much of it, because they usually have plenty of hay, and only feed straw sometimes out of necessity.

An occasional feed of straw furnishes a variety, will be eaten with relish, and do farm animals as much good as if the feed had been hay. Animals that are fed carbonaceous feed, especially if concentrated, will eat straw readily and be much benefited by it. I have seen fattening sheep that had been fed large quantities of corn eat the straw placed under them for bedding twice a week in preference to good clover hay in their mangers. Comparatively idle horses can be kept on straw largely without any increase in their grain rations, and be in good condition the following spring. Good, bright straw is better feed for a horse than damaged, musty hay of any kind.

Where straw is made a regular part of the ration, I prefer putting it under the mangers, and allowing them to select such as they prefer, using the remainder for bedding. They prefer the chaff to anything else. Some farmers have the chaff separated from the straw when threshing, and store it in the barn, using it for feed during the winter, while the straw is stacked outside. It is well to remember that straw fed in a good, warm stable will produce nearly or quite as good results as hay fed in the yard, where a good part is wasted. Considerably more feed is required to support an animal out of doors in winter than in a warm stable.

Both wheat and oat straw compare very favourably with clover and timothy hay in proportions of nitrogen free extract, or carbohydrates and fat. They are mainly deficient in protein, especially when compared with clover. This deficiency may readily be overcome by feeding bran, oil, or cotton-seed meal. It should be remembered, too, that clover hay is exceptionally rich in protein. The following table gives the composition of each:—

| | | Protein. | | Starches, Sugars, &c. | | Pa'. |
|-----------------|-----|----------|-----|--------------------------|-----|------|
| Wheat straw ... | ... | 3.4 | ... | 43.4 | ... | 1.3 |
| Oat straw ... | ... | 4.0 | ... | 42.0 | ... | 2.3 |
| Clover hay ... | ... | 12.3 | ... | 38.1 | ... | 3.3 |
| Timothy ... | ... | 5.9 | ... | 45.0 | ... | 2.5 |

Aside from the high value of straw as feed, it also has great manurial value, and none should be wasted. It is the natural base or foundation for all stable manure. It is one of the best absorbents we have in any quantity on the farm, and it should all be used for that purpose. Unless used for bedding and saturated with liquid manure, it is of little value as a fertiliser. Liquid manure contains more plant food than the solid, and all of it should be carefully saved. The most satisfactory way of saving it is by absorbing it with straw or other suitable material.—*American Agriculturist*.

THE NUTRITIVE VALUE AND ECONOMIC USES OF MAIZE.

MAIZE or Indian corn, the characteristic cereal of North America, is, next to cotton, the most valuable crop grown in the United States. It is admitted free of duty into Canada, and is also largely grown in the Dominion for consumption, in its green state, as a vegetable; indeed, with the possible exception of tomatoes and, of course, potatoes, "canned corn" is the most extensively used vegetable in both countries. The Canadian Government is, at the present moment, making efforts to create a trade for it in the United Kingdom, where many people are quite unaware of its dietetic value. Should maize once come into favour as a food, a considerable home industry might arise, as the climate is considered to be quite suitable for its growth. As will be noted later, great quantities of maize are utilised for the production of glucose, employed very largely in the brewing and confectionery industries. At present the trade is almost entirely in the hands of an American trust, which, during the recent war with Spain, shipped large consignments of glucose to the United Kingdom, *via* Canada. The attention of the High Commissioner having been called to this fact, he authorised the Curator of the Canadian Section of the Imperial Institute, and others, to inquire into the extent of the trade, with the result that a comprehensive report was sent to Ottawa on the subject, and during his recent visit to that city Lord Strathcona himself brought the whole question before the Department of Trade and Commerce, in the interests of Canadian industry. A bulletin recently issued by the United States Department of Agriculture, dealing at length with the composition and economic applications of maize, is of value in this connection. The following is a brief abstract:—"In the United States, maize or Indian corn not only serves as one of the chief articles of food, but is also the source of a large alcohol industry. The stalks, which a few years ago were considered waste product, have been found to possess valuable properties as a cattle food. The pith is very suitable as a lining for cattle-ships, and as its peculiar structure allows of ready nitration, and the resulting compounds are said to be more stable than the corresponding cotton-derivatives, maize-pith has special advantages for the preparation of pyroxylin-varnishes, gun-cotton, and high explosives."

COMPOSITION.

Typical American maize has, approximately, the following composition :—

| | | | | |
|----------------------------------|-----|-----|-----|-----------------|
| Weight of 100 kernels | ... | ... | ... | 38 grammes. |
| Moisture | ... | ... | ... | 10.75 per cent. |
| Proteids | ... | ... | ... | 10.00 " |
| Oil | ... | ... | ... | 4.25 " |
| Crude fibre | ... | ... | ... | 1.75 " |
| Ash | ... | ... | ... | 1.50 " |
| Carbohydrates (other than fibre) | ... | ... | ... | 71.75 " |

Although certain varieties of "early-maturing" maize, or "sweet" maize intended for table use, when partially ripe, contain considerably larger quantities of both sugar and oil than do the ordinary ones, it appears from the many analyses which have been made in the departmental laboratories that maize is one of the most invariable of the cereals, maintaining, under very different climatic conditions, a remarkably uniform composition, and varying chiefly in the size, colour, and physical characteristics of the individual kernels.

THE MILLING OF MAIZE.

The flour made from Indian corn is known as "cornmeal." The simplest and one of the most prevalent methods of preparing it was to grind the kernels between stones, and use the whole meal, coarsely sifted. In the Southern States this process is still largely employed. A finer grade of the cornmeal is prepared by first grinding in the above manner, and then bolting to remove the greater part of the bran. Unfortunately, the meal thus prepared is very hygroscopic, and, as the germ contains a large proportion of the oil, the product is apt to become rancid and mouldy. Improved processes have hence been introduced during the last few years, and the following description is fairly applicable to the majority of them.

The grain is first broken, and the germ loosened in a "degerminator." The germ and the hull are then separated by means of bolting cloths and currents of air, and the remaining corn is ground between corrugated iron rollers. The resulting meal is again submitted to bolting and purification by currents of air, and the refined product is known as *granular* meal. The waste matter (hull, germ, flinty portions of the corn, &c.) amounts to about 30 to 35 per cent. The use of artificial heat during the processes ensures better results, and the meal keeps longer. Notwithstanding the improved methods of preparation, this granular meal has not found favour in the Southern States.

Apart from the methods of manufacture, there are two distinct kinds of cornmeal, distinguished by their colour—viz., the white and the yellow. These colours are due to the original tint of the corn, and there is probably but little difference in nutritive value and palatableness of the two varieties.

RELATIVE NUTRITIVE PROPERTIES OF WHEAT AND MAIZE.

Although so extensively used in America, there is a widespread opinion in Europe that the products of Indian corn are less digestible and less nutritious than those of wheat. This opinion, it appears, has no justification, either from the chemical composition of the two classes of bodies or recorded digestive and nutritive experiments. A study of the analytical data of the whole grain shows that, in so far as actual nutrients are concerned, maize is fully equal to wheat. The ash content of maize being small, there is no doubt that there is a slight deficiency in the mineral food employed for the nourishment of the body, but, as the cereals contain an excess of mineral matter above the requirements of the body, this slight deficiency may be disregarded. In its percentage of fat, Indian corn easily takes precedence over all other cereals, with the single exception of hulled oats; while of digestible carbohydrates (such as starch, sugar, dextrin, &c.) it possesses a higher proportion than hulled oats, almost the same as wheat, and slightly less than rye or barley. With the exception of oats, Indian corn contains nearly the same quantity of proteid matters as the other leading cereals.

In this connection it is interesting to note that manual labour in the southern part of the United States is performed almost exclusively on a diet of Indian corn bread and fat pork.

It is suggested by the Department of Agriculture that the systematic cultivation of specially selected seeds should be commenced at once, with a view to increasing the percentage of proteid matter, as the ratio of nitrogenous to other digestible constituents is, at present, rather low.

MAIZE OIL.

In the manufacture of starch and glucose, and of some varieties of maize-meal, the germ of the grain, which contains the larger proportion of oil, is extracted. From this germ an oil of considerable economic value is expressed, while the residue forms a nutritious food material, fully equal to that obtained by the expression of the oil from ordinary oil seeds. Maize oil is easily purified, and forms a light amber-coloured transparent liquid, without rancidity and of a pleasant taste. It has been used to some extent as a salad oil, and also as a lubricant, and, having good burning properties, as an illuminant. The coarser varieties of the oil are used in soap manufacture. The commercial value is stated to be fully equal to that of cotton-seed oil.

COMPOSITION AND PROPERTIES OF THE STALKS.

Until a few years ago the stalks of maize were considered of little value for feeding or other purposes, although the blades of the stalks have been used as a cattle food from the earliest times. The proportions of the different parts of maize stover are:—

| | | | | | |
|--------------------|-----|-----|-----|-----|----------------|
| Leaves and husks | ... | ... | ... | ... | 65.2 per cent. |
| Stalk without pith | ... | ... | ... | ... | 24.5 „ |
| Pith | ... | ... | ... | ... | 10.3 „ |

The average chemical composition of the air-dried stover is as follows:—

| | | | | | |
|--|-----|-----|-----|-----|----------------|
| Moisture | ... | ... | ... | ... | 9.80 per cent. |
| Proteids | ... | ... | ... | ... | 4.31 „ |
| Ether extract (oil, &c.) | ... | ... | ... | ... | 2.37 „ |
| Crude fibre | ... | ... | ... | ... | 28.29 „ |
| Ash | ... | ... | ... | ... | 4.50 „ |
| Carbohydrates (other than crude fibre) | ... | ... | ... | ... | 40.33 „ |

Maize stover, in one form and another, is now being largely used as fodder, and in some districts its use excludes even that of clover and timothy hay. The stover is usually finely shredded, as this not only increases the quantity which becomes available for food, but also leaves the manure in a better condition for spreading on the field. The pith is also removed from the stalks, as it is much less digestible.

MANUFACTURE OF STARCH AND GLUCOSE.

The bulk of the starch used in the United States is made from Indian corn, there being only small quantities made from potatoes and cassava. The yield of starch is good, about 60 to 65 per cent. being available. In its preparation the grains are first softened in hot water, and then crushed to a fine pulp between stones or rollers. The pulp is now transferred to shakers, lined with fine cloth, and the starch washed through the meshes by means of a current of water; it is allowed to settle, and, the supernatant liquid having been poured off, the moist blocks are removed and allowed to dry. When the product is required for cooking purposes, it undergoes further purification.

The manufacture of grape sugar or glucose from maize starch is now an extensive industry in the United States, about 40,000,000 bushels of corn being used annually. The product known commercially as “grape sugar” is solid, and is employed as a substitute for malt in the brewing of beer and ale. Another product, known as “glucose,” is a thick colourless syrup, which is used in the preparation of table syrups as well as for confectionery, and for adulterating molasses and honey.

MANUFACTURE OF WHISKY AND ALCOHOL.

It is estimated that more whisky is now made in the United States from Indian corn than from all other grains combined. The product is generally known as "Bourbon," to distinguish it from rye whisky. The process of manufacture is analogous to that used in the preparation of whisky from other cereals. The starch is converted into fermentable sugars by diastatic action, and the resulting mash fermented and distilled. A considerable quantity of alcohols belonging to the "fusel oil" series is produced, but these may be removed by allowing the whisky to mature a sufficiently long time. The distillation of alcohol consumes about 15,000,000 bushels of Indian corn annually.

The glutinous and other residues from the manufacture of starch, glucose, and alcohol were formerly regarded as waste material, but it has been found that, after careful drying, they furnish a cattle food, the nutritive value of which is fully equal to that of "brewers' grains."

MACARONI WHEATS.

IN a report to the Secretary for Agriculture of New South Wales, Mr. G. Valder, Principal of the Hawkesbury Agricultural College, points out that the soil and climate of the Cumberland district are eminently suitable for the cultivation of macaroni wheats, for grain and for hay. The prevalence of rust in the coast districts makes it desirable that the cultivation of these wheats should be entered upon by the farmers.

Mr. Valder, in his report, says:—For the past few years, the department has been experimenting with macaroni wheats, and last season two of the best varieties were selected and planted on a large scale. The result was most satisfactory, the yield being very good. Samples of the grain were submitted to Mr. Farrer, the wheat experimentalist; and he reports as follows:—"The samples are well grown, being plump and attractive. The trials have demonstrated that the wheats can be successfully grown in the coastal counties, where the rust pest in all but exceptionally favourable seasons causes the growing of bread wheats to be unremunerative."

Mr. Cook thinks that this should lead at no distant future to the establishment of a macaroni-making industry in Sydney; and to our getting this food, which when fresh is nutritious, and suitable for this climate. The imported stuff is often stale, and is made in a manner and amidst surroundings of which we are happily ignorant. He says that further experiments with the object of obtaining varieties which are specially suitable to our climate are being carried on, and for this purpose a number of new crossbred macaroni wheats are now being planted on the Hawkesbury Agricultural College farm. It is also intended to further experiment with these wheats for testing their suitability for hay purposes. The varieties grown on a large scale last season averaged over 6 feet in height, and this, coupled with the fact that the straw is more solid than that of the bread wheats, makes the hay made from them to weigh well. This indicates that these wheats should be profitable for the farmer to grow; as, if they are cut before they have gone out of flower, the beards which they all carry will be too tender to be objectionable. There are also on trial this farm a number of hybrids between bread wheats and macaroni wheats, containing different proportions of macaroni wheat bloods. These hybrids have been made for the purpose of testing whether or to what extent a dash of macaroni wheat blood in them is efficacious for adapting bread wheats to the adverse conditions of our coastal counties. Mr. Cook thinks the above and other experiments ought to make the Hawkesbury specially attractive next spring to all the progressive farmers of the county of Cumberland, and of the coastal districts generally. It should be remembered, the Minister adds, that of all those who visit the farm, none are more welcome than our work-a-day farmers.

EXPERIMENTAL PLOTS.

WE have already, in a former number of the *Journal* (Vol. IV., March 1899), explained the object of experiment farms, and we quoted Professor Paul Wagner, Ph.D., Director of the Government Agricultural Research Station at Darmstadt, Germany, in support of the value of increasing the productiveness of soils by the application of manures, after manurial experiments with certain crops had been carried out, and the results accurately recorded and tabulated. We now give the Professor's methods of harvesting these experimental crops. The replies to the following questions are worth reading:—

HOW SHOULD STRAW CROPS BE HARVESTED, AND HOW SHOULD THE HARVEST WEIGHT OF STRAW AND GRAIN BE DETERMINED?

Straw crops should be cut with a scythe, but if the harvester is not sufficiently skilful to keep the boundaries well, a sickle should be used to cut the marginal rows. The cut crop is at once bound into sheaves, each sheaf immediately weighed, and as soon as the yield of any such single plot is duly recorded, an average sample of about 10 lb. is taken from it. The sample is placed in a clean sack, and a wooden label bearing the number of the plot is thrown in with it; the sack is then tied up tightly, another wooden label, with the number of the plot, is attached, and the sack put aside (if possible, out of the sun) and covered with cloths or sacks, to prevent the sample losing any moisture by evaporation.

When all the plots have been harvested, the various samples should be taken to a place where they can be accurately weighed, and for this purpose the contents of each sack are shaken out and weighed separately, the weight is noted and the contents returned to the sacks, which are then hung up to dry. After the samples have become air-dried, they are again turned out and weighed, and the weight of water lost is recorded, as well as the weight of air-dried substance remaining.

Each sample is now transferred to a capacious linen sack, laid on the ground and threshed, and ultimately shaken out on to a metal tray, a yard or so in diameter; the straw is gathered up, the residue sifted through a sieve varying in mesh from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch, according to the size of the corn. The residue on the sieve is mixed with the straw; the siftings—that is, the corn and chaff—are accurately weighed; a proceeding which is also applied to the straw. The chaff is subsequently winnowed from the corn, and is accurately weighed, and its weight deducted from the combined weight of the corn and chaff.

In this manner is ascertained, with exactitude, the amount of dry substance, and the proportion of straw, corn, and chaff in the samples taken from the field; and the yield of the plot in straw, corn, and chaff, in an air-dried condition, can be easily calculated from the total weight of the sheaves, and the data obtained in these various weighings.

It is well to notice here how accurately and conveniently all these computations can be carried out, and to compare with this the labour and trouble that would be entailed in harvesting the produce from larger areas of land, such as $\frac{1}{4}$ of an acre, and the inevitable loss by falling corn in the field and while carrying and manipulating larger quantities. It will thus readily be realised how great are the advantages of the method here described.

HOW SHOULD POTATOES AND TURNIPS BE HARVESTED AND THEIR WEIGHTS DETERMINED?

Potato and root harvests present no difficulties. The haulms of potato crops are not as a rule harvested, as the yield is not constant, and they also have no particular signification. The tubers are carefully dug up and spread over their particular plot to dry and to let the adhering mould fall off. They are then collected in a tared and ticketed sack and weighed. A 20-lb. sample is then selected from the combined produce of the three similarly manured plots and placed in a ticketed sack, to serve for the determination of the mould still adhering, the amount of dry substance, starch, &c.

Roots are treated in a similar manner. The leaves are cut, weighed fresh, and a 10-lb. average sample taken from the combined crop of the similarly manured plots, to serve for the determination of dry matter. The roots are placed in a tared basket, 2½ feet deep and 2 feet in diameter, weighed, and a sample of the combined similarly manured crops taken for ascertaining the weight of adhering mould and dry matter.

HOW SHOULD THE YIELD OF MEADOWS AND CLOVER FIELDS BE DETERMINED?

Meadows and clover fields are cut at the usual period. The masses harvested from each particular plot are wrapped in cloths in quantities of about 140 to 160 lb. Mean samples of about 10 lb. each are taken from the duplicate plots, marked, carried, weighed, exposed to dry in a suitable place where they are protected from loss by wind, &c. When dry they are again weighed, and the yield of dry substance is recorded.

The harvested crop cannot be efficiently dried in the field or meadow, inasmuch as rain, loss of leaf, and all sorts of uncontrollable disturbing influences lead to errors that make results quite unreliable.

IS A CHEMICAL EXAMINATION OF THE PRODUCE AND OF THE SOIL OF VALUE?

This question is to be answered decidedly in the affirmative, because, in addition to the weight of the produce, a knowledge of the total amount of nitrogen, phosphoric acid, and potash in the harvested product, and of the store of these constituents in the soil, is absolutely necessary in order either to obtain a satisfactory insight into the manurial requirements of the soil, or to form a clear and decided judgment on the action of the manurings.

Therefore, samples of harvested produce should be sent to an agricultural chemist, of recognised ability, to be subjected to chemical analysis. Moreover, it is advantageous to send in a sample of the particular soil for the same purpose. The soil sample should be taken from the unmanured plot, and it is recommended to defer taking it until the end of the experiment—that is, until after the gathering of harvest—for then only can it be known whether a chemical examination of the soil is requisite or not. If any derangement, omission, or inaccuracy has occurred in the conduct of the experiments, or if the yields from duplicate plots differ too widely from one another on account of the inequalities of the soil, the whole experiment would, as a matter of course, be worthless, and there would be no need for an examination of the soil.

The sample is taken in the following way:—A pit 1 foot deep, with sides as straight as possible, is dug with a spade and spoon-shaped shovel, the earth removed is collected in a barrow, and a similar proceeding is followed at another spot on the same plot, and then two holes are excavated in the same way in each of the duplicate plots, so that the barrow ultimately contains the samples taken from six different spots.

The contents of the barrow are then carefully mixed, and an average sample of about 10 lb. taken, put into an unused sack and sent to the chemist. Particular care must be taken that a perfectly clean sack is used, and on no account must a manure sack be used for this purpose, even if it has been washed.

WHAT NOTES SHOULD BE MADE CONCERNING THE FIELD, PREVIOUS CROPPING, &c., &c.?

Notes on the general condition of the soil, and on its cultivation, as well as information of the previous cropping, and of the period and magnitude of the last dressing with farmyard manure, or of any green manuring, or of the use of other manures in preceding years; all must be known in order to form a correct judgment on the results of the experiments. It is useful to have forms upon which to enter these data.

FARM CHEMISTRY—THE USE OF KAINIT.

In the report of the North of England experiments with crops and stocks, the following interesting account appears of the use of kainit:—During past years it has been shown that in almost every case kainit, or some other kind of potash, should form part of an artificial mixture for use without dung. This matter has again received confirmation in 1898. At Staindrop, 5 cwt. superphosphate plus $1\frac{1}{2}$ cwt. sulphate of ammonia produced 16 tons 9 cwt. of swedes, while the addition of 2 and 4 cwt. of kainit raised the crop to 17 tons 7 cwt. and 17 tons 15 cwt. respectively. At Garforth, the first 2 cwt. of kainit produced an increase of 2 tons 15 cwt. of roots, to which the second 2 cwt. only added 4 cwt. of roots. Even in the first year the smaller dressing has given a profit, though the extra 2 cwt. has only been profitable if it has left considerable residue, as experience leads us to believe will be the case. We have again, at Cockle Park, had a remarkable example of the value of potash in a turnip manure employed without dung. A dressing of $1\frac{1}{2}$ cwt. of sulphate of ammonia and 7 cwt. superphosphate gave a crop of 8 tons 3 cwt., whereas the crop got by the same substances plus 6 cwt. of kainit weighed 25 tons 5 cwt. It is worthy of note that the crop was 5 tons lighter where sulphate of ammonia and superphosphate were employed without kainit than it was on the land getting no manure whatever. This result is similar to that obtained at the same place in 1897, and shows that, in an extreme case, such as is presented at Cockle Park, artificial manures without potash used for turnips on tillage land may do more harm than good. Why this should be so is an interesting physiological question, but one that need not now be discussed.

CAN LIME ACT AS A SUBSTITUTE FOR POTASH?

This point was dealt with at Cockle Park. Three contiguous plots were dressed with 7 cwt. rape meal and $5\frac{1}{2}$ cwt. basic slag, and in addition one plot received 6 cwt. kainit, another 1 ton of ground lime, while the third got both the kainit and the lime. The result was that—

| | | | | | Swedes. Tons cwt. |
|--------------------|---|--------|-----------------|-----|----------------------|
| Rape meal and slag | + | kainit | ... | ... | gave 21 14 |
| " | " | + | lime | ... | " 17 12 |
| " | " | + | kainit and lime | ... | " 20 6 |

Clearly, therefore, lime has proved but a poor substitute for kainit, though that it has done something is evident from the fact that the plot getting phosphate and nitrogen but no potash gave a yield of only 8 tons 3 cwt. Where used in the presence of potash the lime has considerably reduced the yield, a result that reminds us of a similar experiment conducted in 1895.

EFFECTS OF KAINIT WITH FARMYARD MANURE

At Staindrop 4 cwt. of kainit was used as an addition to dung and phosphatic-nitrogenous artificials, and raised the yield from 18 tons 11 cwt. (average 3 plots) to 19 tons. At Garforth the increase was 3 cwt. At Peepy and Whitefield 4 cwt. kainit was similarly used, and produced an average increase of 13 cwt. at the former station, and of 18 cwt. at the latter. At Cockle Park 6 cwt. kainit added to dung and artificials increased the crop by 11 cwt. per acre, though 3 cwt. apparently failed to produce an increase. Although kainit has thus done little or nothing in the presence of dung to increase the yield of swedes, its position in this respect is not materially different from that of other artificials.

EFFECT OF KAINIT ON POTATOES.

The addition of $7\frac{1}{2}$ cwt. of mixed artificials, without potash, to 15 tons of farmyard manure has produced an average increase of $6\frac{1}{2}$ cwt. of marketable potatoes. The addition of 1 cwt. of sulphate of potash, costing 9s. to the other artificials, used with dung, has resulted in a marked increase of crop on both sets of plots. The average improvement in the "ware" was over $1\frac{1}{2}$ tons in the

one case, and nearly 1 ton in the other. To the fact that the leaves of the potatoes receiving potash retained their functions for several weeks longer in early autumn than the adjoining crop, which got no potash, is to be attributed the marked increase in crop which the experiment has demonstrated.

The necessity—or, one might almost say, the dependence—of the potato crop upon a supply of farmyard manure is evidenced by the fact that, when the application of dung was suspended, the yield of marketable potatoes was reduced by over 5 tons per acre, and this, too, in the presence of a full dressing of artificials.

In the same experiment three kinds of potash were put to the test, equal money value being the basis of comparison, and this standard is also in harmony with the amount of pure potash used per acre. Both sets of plots give the same answer, and show that muriate of potash has produced a larger yield of potatoes than either kainit or sulphate of potash, while, of the latter two substances, the sulphate of potash has proved superior.

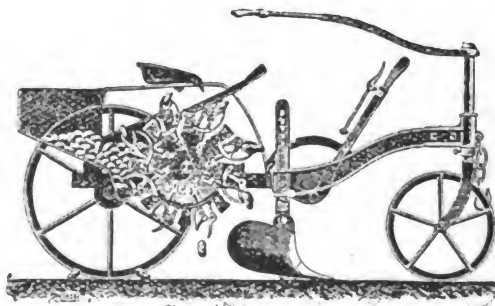
When the muriate of potash was increased from 1 cwt. to 2 cwt. per acre, the yield of “ware” was improved by considerably over a ton per acre.

It is also interesting to note the effect of potash on the proportion of “small” to marketable potatoes. As an example, it may be mentioned that where 15 tons dung, $1\frac{1}{4}$ cwt. sulphate of ammonia, and $6\frac{1}{4}$ cwt. superphosphate were applied, the percentage of “small” to the total crop was 25, whereas with the same manuring, *plus* 1 cwt. of sulphate of potash, the percentage of “small” was reduced to 18. The same tendency is observable where the dressing of muriate of potash was doubled. With a single cwt. per acre, the percentage of “small” potatoes was 34, whereas it was only 23 where a double dressing of muriate was employed.—*Scottish Farmer*.

POTATO PLANTER.

A good potato planter (says *The Mark Lane Express*) is a very valuable implement on the farm or in the market garden. Ransomes, Sims, and Jefferies, Limited, of Ipswich [Suffolk, England], make an excellent machine, which acts on the finger-and-thumb principle. This will plant equally as well as the prize needle-action machine, but it is simpler in construction, and does not pierce the potatoes in picking them up. The mechanism cannot be hurt by stones being put into it with the potatoes. Being simpler in construction, it is also lower in price.

It is well known that at the great trials of potato planters by the Royal Agricultural Society of England, in April, 1896, Ransomes, Sims, and Jefferies were successful in winning both the first and second prizes for their machines.

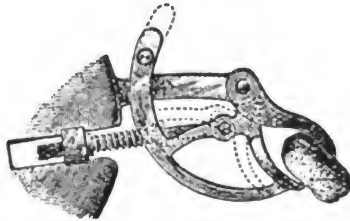


The machine has a hopper and a disc on each side, but the discs are furnished with eight pairs of fingers, or a “finger and thumb,” which pick up and hold the potatoes as the discs revolve. A cam opens the fingers at the right place, and the potatoes drop into their places as if put in by hand. It

will plant two rows at a time from 24 inches to 30 inches apart. The potatoes can be planted at 11, 12, 13, or 14 inches in the rows, change wheels being provided for the purpose.

This planter is fitted with two ridging bodies which make the furrows for the potatoes to be dropped in, and a marker shows the position for the next bout. These are required when planting on the flat, in which the greatest saving of labour is effected by machine planting.

If, however, the planter is wanted for planting on manure in between ridges previously formed, it can be fitted with wheels with concave rims, which run on the ridges, and with disc press wheels (instead of ridging bodies) to press down the manure and prepare a suitable place for the potatoes to fall into. The horses walk in the furrows.



The machine can be made when desired to cover the potatoes as it goes along, in which case coverers are fixed behind each disc. It is, however, generally considered better not to cover them by the machine, as, of course, there must be a few misses, and a boy walking behind can easily drop a potato where missed, and the cost of his wages will be covered by the extra roots grown.

The machine will plant ordinary seed potatoes with only 5 per cent. of missed plants. The weight of the planter is about 7 cwt.

A TYPICAL HEREFORD STUD FARM.

THE old order of things changeth! Nowhere is this more apparent than in the methods to-day adopted by the pastoralists and agriculturists of Australasia. Those who can remember "the good old days" look back to their early struggles with inferior cattle, hairy sheep, razor-backed pigs, hand labour in cultivation, and, generally, on all the primitive appliances for working stock, raising crops, producing sugar, arrowroot, and other things demanding the employment of machinery with a half regret, yet at the same time with thankfulness that science, in all branches of rural pursuits, has enabled them to cope successfully with the requirements of the new generation, with the numerous drawbacks which have of late "so headdled on the heads" of the stock-breeder, the sugar-planter, and the farmer, and with the mad competition which has of late years taxed to the utmost the energies and abilities of our Australasian producers.

When the famed Darling Downs were first occupied by the old-time pastoralists, whose names will live in history whilst Australia is Australia, many were the troubles the squatters had to contend against. Distance was then distance; there were no trains, and few coaches. The natives were numerous and hostile. The luxuries of life were practically unattainable. Mutton, damper, and tea constituted, as a rule, the rations of master and man. All this is now ancient history. Railways and coaches have annihilated space. When formerly a visit to Brisbane from the western limits of civilisation involved a weary journey on horseback of two or three weeks' duration, to-day the same journey can be performed in twenty-four hours in comfort. The term "native" in the West no longer implies a blackfellow. Hereby hangs a little tale which, told here, will relieve the hard matter-of-fact of this article.

A certain well-known squatter, many years ago, paid a visit to the old country, and in conversation with one of his old friends the latter remarked: "I hear you are married. Did you marry an English or Scotch girl?" "Oh!" replied the squatter. "I married a native." A change came over the face of his friend, who asked no more questions.

A few days thereafter the squatter and his wife (who, by-the-bye, was very fair) went to a dinner party, where the abovementioned friend was also a guest. The friend carried himself very stiffly towards the squatter, so much so that the latter thought it necessary to ask for an explanation. Whereupon the friend sternly remarked: "It may be looked lightly upon in Australia, but here it is considered very bad form to play silly practical jokes on one's friend." "What are you alluding to?" asked the Australian. "Why!" said his friend; "you deliberately stated to me that you had married a black woman, whereas your wife is much fairer than the average Englishwoman. I cannot see the joke in that." It took the astonished squatter some time to explain to his friend that he had never intended a joke or to convey to him that he had married a black woman. "But you said you had married a native." "Well! We call all white children born in the colony 'natives.' The blacks are blacks, or myalls, or niggers."

The explanation, needless to say, was satisfactory. With this little interpolation, we resume our dissertation on old-time and present-day squatting.

As the early settlers progressed and population increased, the business of the cattle men and sheep men assumed a different form. Great attention was paid to the introduction of good blood amongst the flocks and herds of the Darling Downs, and eventually stud farms were established on many of the large stations. Large prices were paid for imported stock, and the results have ever since shown the wisdom of this action. Amongst the stud farms of Queensland, we select on this occasion as a typical station

THE HEREFORD STUD FARM AT BRAESIDE.

Braeside is the property of the Hon. William Allan, M L C., who purchased it over twenty years ago from Mr. F. H. Needham, who bought it from Mr. B. C. Parr, who took it up originally, when it formed a portion of the Rosenthal Station. It has an area of 12,000 acres, including Crystal Mountain, every acre of which is available for fattening stock, although it hardly need be said that this branch of the business is not entered into at Braeside, the proprietor's object being to raise purebred Hereford cattle and black merino and Lincoln sheep.

The station is situated amongst the mountains at an elevation of 2,800 feet above sea-level, and is well watered by many streams, into which the American Rainbow Trout (*Salmo irideus*) has been successfully introduced.

To those who are possessed with the idea that Southern Queensland is a tropical country, it may be news to learn that during the winter, which may be said to last herefrom May to October, the thermometer has on occasions registered 12 degrees F., and on one occasion, some eight years ago, the mercury fell to 4 degrees F. The latter reading is, however, based more on tradition than on absolute records taken at the time. Snow frequently falls during the months of June, July, and August. The lowest record for this year is 17 degrees F., and snow fell on the 2nd and 6th July.

It is not surprising, under such circumstances, to find that all European fruits come to perfection, as the trees have got what they miss on the warmer coast lands—a rest during the winter season.

The homestead, of which our frontispiece gives a good idea, is situated on a gently rising hill on Turner's Creek, and is surrounded by gardens, an orchard, and well-trimmed privet hedges and gravelled walks. In the garden may be seen primroses, stocks, wallflowers, hollyhocks, violets, and many other European flowers, whilst the orchard contains pear, apple, quince, apricot, plum, cherry, peach, and other trees. The soil and climate render this part of the colony an ideal apple-growing country. Apart from its horticultural advantages, it is an

Plate CXXV.



PURE-BRED HEREFORD COWS AT BRAESIDE.

admirable health resort, the bracing air, and the cool nights even in the hottest summer, making it a delightful place of residence for an invalid jaded with the heat of the days and the sultry summer nights of the coast country.

Although not an agricultural district, there are several small cultivated paddocks, where lucerne, wheat, oats, barley, maize, and potatoes are grown for home use. The uncultivated portion is hilly, heavily timbered, and stony. The timber consists mainly of box, gum, ironbark, apple-tree, and wattle, the latter of which is in many parts stripped for tanning purposes, the bark fetching from £2 10s. to £5 per ton according to demand.

Sheep and cattle thrive admirably, and, wherever ringbarking has been done, the carrying capabilities of the run have been much improved, and a sheep to the acre, or its equivalent in cattle, is not considered excessive.

The locality is especially well adapted for wool-growing, as will be shown in our next article. Mr. Allan breeds Lincolns and white and black merinos, which are described and illustrated further on.

For the present we are only concerned with the purebred Hereford herd. It may, however, be mentioned that the dairy herd consists of very fine pure and grade Jerseys.

The specialty, then, of Braeside is a large herd of Herefords, numbering over 1,000, which have all descended in direct line from high-class imported English stock. The whole of these are duly entered in the Braeside stud-books, in which they are named, numbered, and pedigreed.

The dams are the lineal descendants of 36 purebred cows with which Mr. Allan commenced operations over twenty years ago. These cows were purchased by him from Messrs. Robertson Brothers, of Colac, Western Victoria, at their great breaking-up sale in January, 1878.

The stud herd comprises 338 bulls, 467 cows, and 278 heifers from seven to nine months old. All these fine animals are well worthy of a visit from anyone interested in stock-breeding.

Mr. Allan kindly afforded our artist, Mr. F. C. Wills, every assistance in taking photographs of them, some of which are here reproduced.

The values of the bulls range from £250 for such grand animals as Horace Wilton (imp.) to £50, £30, and £21 for selected stud bulls, whilst £8 8s. is the usual price for ordinary herd bulls.

CHARACTER OF HEREFORDS.

They are very stylish in appearance, and plainly show their pure breeding, and, having been born and bred in the cold hard hill country, are perfectly healthy and strong. They are exceedingly lively, yet remarkably docile, allowing even women and children to pass them without notice. To meet a bull in an English meadow is an unpleasant experience, which often ends in disaster to the intruder, but the case is different in Queensland. Bulls running freely in large paddocks are rarely dangerous. Of this the writer had good proof at Braeside. Unknown to him, the three powerful-looking animals shown in our illustration were grazing on a narrow piece of ground between the garden and the creek. He was going along the creek bank, looking out for the trout, when suddenly he found himself face to face with all three. They simply stared at the stranger; and when ordered to "get out of that," they meekly obeyed and retired. Large as are the Herefords here, they increase much in size when sent to warmer pastures. They are, moreover, capital travellers. In colour they are dark-red, with characteristic white faces and bellies, the majority having a white mark on the shoulder, but this last peculiarity is not a *sin qua non*, as the breeder prefers a minimum to a maximum of white on his cattle, excepting, of course, the predominating characteristic of the white face and belly.

The likeness of all these animals to each other, both in form and colour, is remarkable. They remind one forcibly of Tweedle-dum and Tweedle-dee in "Alice in Wonderland." It is a sight to be remembered to have a close view of two or three hundred full-grown bulls peaceably feeding together, the general opinion of the city man being that bulls, when placed together in a paddock,

spend their leisure time in carrying on desperate battles with each other. As far as fighting is concerned, this herd of bulls appeared to us as tame as a flock of sheep, even allowing the artist to walk towards them with his camera.

It will undoubtedly be of much interest to such of our readers who are engaged in cattle-breeding to examine the pedigrees of some of these grand sires. We therefore append a few culled from Mr. Allan's herd-book.

It should be mentioned that no disease has ever made its appearance in this herd; the country also is perfectly clear of ticks. Still, all the bulls for sale are being inoculated, as purchasers who take them to tick-infested country require this to be done.

No female cattle have ever been added by purchase or otherwise to the herd, except by breeding.

One of the sires in use is Horace Wilton. This grand animal was purchased by Mr. Allan personally from the famous breeder of Hereford cattle, Mr. John Tudge, Herefordshire, England, just after the bull had taken first prize at Lord Tredegar's show at Newport, in 1891, in a class of twenty-two young bulls.

SOME OF THE PEDIGREES.

HORACE WILTON.

Calved 28th November, 1890.

Sire—Hartington.

| | |
|----------------------------|------------------|
| Dam—Golden Pippin | Sire—Alton |
| g d Apple Blossom 3rd | „ Wilton Monarch |
| g g d Apple Blossom | „ Irvington Boy |
| g g g d Blossom | „ Sir John |
| g g g g d Beauty 2nd | „ Philip |
| g g g g g d Beauty | „ Luck's All |
| g g g g g g d Spark | „ Miliam |
| g g g g g g g d Spark | „ Plunder |
| g g g g g g g g d Highlass | „ Northampton. |

PUREBRED BULL BRAESIDE.

Calved 6th November, 1896; bred by the Hon. William Allan.

Sire—Sir Henry Loch.

| | |
|--|-----------|
| Dam—Pepper | Sire—Duke |
| g d Gaylass | „ Chance |
| g g d Amy | „ Lucknow |
| g g g d — | „ Sultan |
| g g g g d Bred by Messrs. Robertson Brothers, Colac, Western Victoria, from pure imported stock. | |

SIR HENRY LOCH.

Calved 5th July, 1886; bred by Mr. Henry Beattie, Mount Aitken, Victoria.

Sire—Patron.

| | |
|-------------------------------|-----------------------------------|
| Dam—Sunrise | Sire Master Hall 3rd |
| g d *Princess 2nd | „ (Champion sire) Cop Hall (imp.) |
| (Champion cow) | |
| g g d Moiety | „ Starling |
| g g g d May Morn | „ Starling |
| g g g g d Diana | „ Jerry (imported) |
| g g g g g d Edith | „ Tooradin (imported) |
| g g g g g g d Star (imported) | „ Restorative |
| g g g g g g g d Exhibition | „ Sibton |
| g g g g g g g g d Stockton | „ Dayhouse, &c., &c. |

* Princess the 2nd was undoubtedly the best Hereford female ever bred or exhibited in Australia.



YOUNG HEREFORD BULLS.

"Albert Victor," "Jupiter," "Tramp," "Trumpeter," "Wilton Grange."



PURE-BRED HEREFORD BULLS.

"Alfonso 2nd," "Braeside," "Horace Wilton."

ALFONSO 2ND.

Red, white-faced; calved 11th July, 1892; bred by Mr. Henry Beattie, Mount Aitken, Victoria.

Sire—Alfonso (imported), bred by Mr. Green, The Whitten, Kingston, Herefordshire.

| | |
|---------------------------------|--------------------------------------|
| Dam—Princess 4th | Sire Patron, by Dale Tredegar (imp.) |
| g d Princess 2nd | „ Cop Hall |
| g g d Moiety | „ Starling |
| g g g d May Morn | „ Starling |
| g g g d Diana | „ Jerry (imported) |
| g g g g d Edith | „ Tooradin |
| g g g g g d Star (imported) | „ Restorative |
| g g g g g g d Exhibition | „ Sibton |
| g g g g g g g d Dam by Stockton | „ Dayhouse. |

SON OF JESSE.

Calved 13th August, 1886; bred by the Hon. J. H. Angas, Collingrove, South Australia.

Sire—Sir Roger.

| | |
|---|--------------------|
| Dam—Jessamine | Sire—Turner's Duke |
| g d Effie Deans | „ Goolwa |
| g g d Jeannie Deans | „ Bringwood |
| g g g d Pigeon, imported by C. B. Fisher. | |

All these took first prizes at South Australian shows. Jeannie Deans has taken 7 first and Champion prizes, and was sold, with her bull calf, for 200 guineas, to Mr. Angas.

The pedigrees of the five handsome young Hereford bulls shown in our illustration are as follow :—

ALBERT VICTOR.

Calved 30th October, 1898; bred by the Hon. William Allan, M.L.C., Braeside, Dalveen.

Sire—Alfonso 2nd.

| | |
|----------------|----------------|
| Dam—Delectable | Sire—Duke |
| g d Jane | „ Sir Benjamin |
| g g d Clara | „ Moro |
| g g g d — | „ Autocrat. |

JUPITER.

Calved 2nd December, 1893.

Sire—Son of Jesse.

| | |
|-----------------|---------------------|
| Dam—Lemure | Sire—Sir Henry Loch |
| g d Ornina | „ Lieutenant Hall |
| g g d Cecilia | „ Duke |
| g g g d Cecilia | „ Moro |
| g g g g d — | „ Van Amburg. |

TRAMP.

Calved 2nd December, 1898.

Sire—Earl Winter.

| | |
|--------------------|----------------------|
| Dam—Quartette | Sire—Lieutenant Hall |
| g d Nautilus | „ Duke |
| g g d Jeannie | „ Sir Benjamin |
| g g g d Eliza | „ Ignatius |
| g g g g d Clorinda | „ Pioneer |
| g g g g g d* — | „ Lord Rodney. |

TRUMPETER.

Calved 31st October, 1898.

Sire—Earl Winter.

| | |
|-------------------|----------------------|
| Dam—Rose | Sire—Lieutenant Hall |
| g d Muriel | „ Duke |
| g g d Grace | „ Chance |
| g g g d Impudence | „ Deception |
| g g g g d* — | „ Van Amburg. |

WILTON GRANGE.

Calved 3rd November, 1898.

Sire—Horace Wilton.

| | |
|---------------------|----------------------|
| Dam—Cajole | Sire—Lord Carrington |
| g d Pandour | „ Duke |
| g g d Hester | „ Sir Benjamin |
| g g g d Lady Rodney | „ Argus |
| g g g g d* — | „ Ploughman. |

When we come to the consideration of the prizes taken by many of these cattle, we are confronted with numberless medals and ribbons. For instance, the winnings of Sir Henry Loch, from 1887 to 1895, are as follow:—

First prize in 1887, as a bull calf, at West Bourke Show (Vic.)

„ „ 1888 „ yearling „ „ „

„ „ 1889 „ aged „ „ „

„ „ 1887, in yearling class, at „Bacchus Marsh“ (Vic.)

Champion prize in 1887, as best Hereford, any age, male or female, at Bacchus March (Vic.)

First prize in 1888, as a 2-year-old, Bacchus Marsh (Vic.)

Champion prize in 1889, as best Hereford, Bacchus Marsh (Vic.)

First prize in 1890, in aged class, West Bourke (Vic.)

First prize in 1890, in aged class, at the Royal Association's Show, Melbourne, beating Mr. Angus's champion, General Gordon.

First prize in 1891, in 2-year-old and over class, at Tenterfield (N.S.W.)

„ „ 1891, in 3-year-old class „ „

„ „ 1892, in 2-year-old class „ „

Special Reserve Champion prize for best Hereford bull, over 24 months, at the National Agricultural and Industrial Exhibition, Brisbane (Q.), in 1892.

First prize and Champion for best Hereford bull in the yards, at Tenterfield, N.S.W., in 1895, and similar prizes for the best class at the same show.

First prize, in aged class, at the Brisbane Exhibition, in 1895.

„ „ for best bull, with progeny, Brisbane Exhibition, in 1895.

Special prize for best Hereford „ „ „

Champion prize for best Hereford „ „ „

Space will not allow of the enumeration of all the performances of members of this justly celebrated herd. Those who are interested in the matter will doubtless be willingly afforded an opportunity of finding out all about them by Mr. Allan, to whose courtesy we are indebted for the above particulars.

BLACK MERINO SHEEP.

Another specialty of Braeside is its flock of black merino sheep, which Mr. Allan started twenty-two years ago, and formed the nucleus of the flock from stock purchased from the well-known breeders, the late Sir Joshua Peter Bell, Sir Patrick Jennings, the Hon. J. D. Macanish, Messrs. Kent and Wienholt, and C. B. Fisher; also he got some of the ewes from Murrumbidgee and Billabong breeders in Riverina. Mr. Allan, noticing that, in spite of drastic culling, black sheep occurred in all flocks, was struck with the idea that possibly sheep were

* Those dams marked with an asterisk are purebred Hereford cows, bought by Mr. Allan from Messrs. Robertson Brothers, Colac, Western Victoria, in 1878, and bred by them from pure imported stock.

Plate CXXVII.

1. BLACK MERINO RAMS AT BRAESIDE.
2. FLOCK OF BLACK MERINO EWES

originally black. To test his theory, he put pure black merino sires to black merino ewes, and found that right from the initiation the experiment was a complete success—the lambs dropped being all black. An almost universal characteristic of these sheep is a small white spot on the forehead, and another on the tip of the tail.

Mr. Allan continued to breed from black sires and ewes for many years until the flock reached 2,000, at which it remained for some years, and now has been reduced to 20 rams, 600 ewes, and 250 wethers and weaners—a total of 870. Our illustrations give a very good idea of the rams and ewes. The former especially form a very remarkable-looking group with their black faces, large curved horns, and bright eyes. Their light legs give the impression that they are exceedingly fleet of foot; that they can jump in a surprising manner, we had ocular demonstration.

The blackness of these sheep does not stop at the wool, but extends to the skin also, and Mr. Allan makes it a *sine qua non* that the tongue and the roof of the mouth shall be black as well. The flesh of the animal is darker in colour than that of the white sheep, sweeter, and has a distinctly “gamey” flavour, akin to the taste of venison. It is thought that these sheep are much harder and less liable to disease than the white ones.

Very high prices have been obtained for the wool. In 1886 Mr. Allan showed at the Colonial and Indian Exhibition, London, a bale of black ewes’ wool of seventy fleeces, about 370 days’ growth, weight 2 cwt. 3 qr. 17 lb. The sheep had been fed on natural grasses only. At the London wool sales in 1885 this wool brought 1s. 6½d. per lb. for the fleece all round in the grease—that is to say, it realised just double what white wool of a similar character grown on the same country brought at that date. The black wool was principally used at that time, and still is, for undyed underclothing under Dr. Jaeger’s system; also, there is at times a demand for black wool for certain continental religious orders who have to wear undyed woollen clothing. Latterly it fell in price through successful dyed imitations being much used. Last December the Braeside black wool brought 10½d. in Brisbane for the fleece. Besides the black sheep, there are 20 Lincoln rams (3 of which are imported), 300 pure and grade Lincoln ewes, and 150 Lincoln wethers and weaners. Braeside is worked in conjunction with Mr. Allan’s Western Whyenbah Station, on the Balonne.

The black sheep cut from one-half to three-quarters of a pound less wool than the white ones. One sheep to the acre is the carrying capacity of Braeside, which is in great contrast to the Western country, where four acres are required for a sheep in ordinary seasons. They are run in paddocks with seven wire fences. These fences cost from £32 to £35 per mile. In concluding this notice, we print a few interesting extracts from Mr. Gibson’s excellent work on “Sheep-breeding in the Argentine.” on pages 267 to 271.

THE ERADICATION OF CHARLOCK.

AMONGST the many members of the genus *Brassica* (or cabbage family), few are such a troublesome pest to the wheat farmer as that known as “charlock.” In the wheat-fields of the Downs, several varieties occur, especially *Brassica sinapis*, but the charlock is more probably amongst the rest, and it exceeds all others in its destructive effect on young growing crops. It gets ahead of the latter, and, before they are strong enough to resist the intrusive stranger, it takes possession with disastrous effect. The weed is easily recognised by its white, yellow, or blue flowers. The seed is very difficult to separate from the pod; in fact, the threshing machine which will do it has not yet been invented. Neither can the seed be easily separated from the grain, especially from oats. Several experiments have been made in Europe, with a view to its destruction, by spraying with solutions of sulphate of copper or of iron. The most successful of these experiments was made on 17th May at the farm of the Agricultural College at Uckfield, in Sussex, where spraying was done by hand and horse-sprayers, the latter proving infinitely superior to the former. The plots of oats, tares, and beans were divided by steps of unsprayed, to show them in

comparison. Eight plots were sprayed on the tares. Where 50 gallons of a 2 per cent. solution were applied to early spring tares, the rows of which were almost lost in the charlock, it was cleared out, except where one plant had covered up a smaller one, and the tares showed up clearly in the rows, making altogether a thoroughly good piece. Very noticeable was a plot of tares, a very little above ground, in which the charlock was quite young also, being little beyond the butterfly leaf; a 2 per cent. solution had cleared the charlock out and left the tares intact. Twelve plots of oats were sprayed. The first lesson learned on the oat plots was that where there is a crop some inches high—in this instance about 4 or 5 inches—a 25-gallon dressing, although useful, was not sufficient; also, that a 50-gallon dressing, although weak, cleared the land of the pest; also, that a 2 per cent. solution of sulphate of copper was practically as effective in the charlock as a 7½ per cent. solution of sulphate of iron, while it in no way distressed the crop, and there was some tingeing of the oat blade by the iron sulphate. The most striking feature was the excellent effect of a 1 per cent. solution of sulphate of copper at 50 gallons. It fell very little short in its effect on the charlock, and was absolutely unnoticeable on the oats. A general consensus of opinion was that on crops at this stage a 2 per cent. solution at 50 gallons, followed by the same quantity of a 1 per cent. in about a week, would absolutely destroy the weed, no matter how thick it stood, or a harrowing might be substituted for the second spraying. In either case the following up of the work when the weed was in an enfeebled condition would destroy all without injury to the crop. It is observed that, where the weed is so thick that the small plants are covered by the big, occasional plants will not get enough to kill them. Even with this, the plants left behind were so few that they might be pulled by hand at small cost. The beans experimented upon were on a neighbouring farm, and were practically enveloped in charlock. Very heavy dressings were applied—as much as 75 gallons of 3 per cent. solution of sulphate of copper and 75 gallons of 6 per cent. sulphate of iron, with the result that the flat and tender leaved beans were strongly tinged; however, the charlock was very much affected, and time will tell as to its results on the bean crop. In the case of the oats and tares, the plots will be left undisturbed to note ultimate effects. Altogether, previous favourable reports of the operation were quite confirmed, and a most instructive set of experiments instituted, in the viewing of which all the visitors were deeply interested, as well as with some grass and other experiments in progress on the college farm.

On the effects of the Uckfield College experiments, Mr. E. Brand writes as follows to the *Farmer and Stockbreeder* :—

EFFECTS OF THE UCKFIELD COLLEGE EXPERIMENTS.

The demonstration of the method, and its effects, of the destruction of charlock among growing crops by means of spraying with the sulphates of iron and copper, which took place at the Agricultural College Farm at Uckfield, on Wednesday, 17th May, brought into notice several significant points—points which, as the demonstration was well attended by agriculturists from far and near, should not be lost upon them, or upon any whose calling or interests lead them to watch with particular keenness the development of what may be called one of the latest benefits conferred upon farmers by experimental research—the destruction of that abominable pest which has been acknowledged hitherto to be more difficult to eradicate than couch or twitch.

The effects upon the crops previously sprayed with the various solutions were ably and untiringly explained by Professor Malden, the principal of the college; and the methods of working the different hand and power machines, and of mixing the solutions, were interestingly shown by Mr. Strawson, who is, it may be said, not only a machinist of fame, but a chemist.

One of the first noticeable points was the generally better effect of sulphate of copper (bluestone) than that of iron; that is to say, while both have a similar effect in destroying the kilk* when applied correctly, the iron salt appeared to injure the crop at the same time rather more distinctly.

* Local name for a certain variety of charlock.—Ed. *Q.A.J.*

The solutions were applied by knapsack machine to oats on 11th May; to tares, plots 1 to 4 on 10th May, plots 5 to 8 11th May; and to beans on 13th May; so that from four to six days had elapsed, and it must be remembered that these have included several very wet days.

THE SOLUTIONS USED.

They were applied as follows:—

1. On oats: (1) Sulphate of iron, $3\frac{1}{2}$ per cent. at 25 and at 50 gallons per acre; $7\frac{1}{2}$ per cent. at 25 and 50 gallons; (2) copper sulphate, 1 per cent. at 50 gallons; 2 per cent. at 15, 25, and 50 gallons; 3 per cent. at 25 and 50 gallons; 4 per cent. at 25 and 50 gallons.

2. On tares: (1) Sulphate of iron, 2 per cent. at 25 and 50 gallons; 4 per cent. at 25 and 50 gallons; (2) the sulphate of copper was applied only at the strength of 2 per cent. and at 25 and 50 gallons, but an additional plot was sprayed with the former quantity at a much younger age—when the plant was only just above ground, in fact.

3. On beans: (1) Sulphate of iron, 3 per cent. at 50 and 75 gallons; 6 per cent. at 25, 50, and 75 gallons; (2) sulphate of copper, the 2 per cent. solution at 50 and 100 gallons; 3 per cent. at 25, 50, and 75 gallons; lastly, the 4 per cent. at 25 and 50 gallons.

The crops were considerably younger than, as far as can be gathered from the reports, has been the case with some of those experimented upon in other places, and the surprising result has been that so much of the charlock, which can only have been in the "twin-leaf" stage, has been destroyed. However, the experiments are, of course, to be continued, and it will be interesting to watch the relative results of spraying at different stages of growth of the crop and weed. Indeed, this is a point, in the opinion of the writer, of considerable importance, in this way: The great pressure of work at the time when charlock generally shoots up in such abundance in spring corn—the crop in which it is most frequently allowed to shed its seed—may cause the spraying to be neglected at such times by many, unless it be made the regular thing, as it ought to be; so that, if it be found much more effective at this time than at any other time in the pre-flowering stage, much of it may escape. Reports of other experiments, however, apparently show, though not conclusively, that spraying is quite effectual at a later stage.

THE EFFECTS OF SOLUTION USED.

Briefly, the solutions which had the best effects upon the oat crop were the 4, 3, 2, and 1 per cent. strengths of the copper sulphate, all at the rate of 50 gallons per acre. The 4 per cent. most effectively destroyed all the kiln, at the same time considerably discolouring the corn. An almost equally good result upon the kiln was obtained by a weaker (2 per cent.) solution at the same quantity, which at the same time had apparently not injured the corn at all. The medium strength (3 per cent.) certainly did more thorough work than that of 2 per cent. strength; but, bearing in mind the greater quantity of rainfall that might generally be relied upon, it might not always be advisable to apply such strong material upon young tender corn in hot blistering weather.

The smaller quantity of the weak solution of iron sulphate had but little effect, while 50 gallons of the 7 per cent. destroyed the kiln, but considerably blackened the outside leaves of the crop. Apparently a solution of moderate strength applied in considerable quantity, and applied carefully, has given the best result here, and the same can be seen right away through upon each crop.

I surmise, however, myself—and how far this will be correct will be seen as the season goes on—that in the end the best results will be obtained upon those plots where the solution has been applied in sufficient quantity to thoroughly destroy the kiln, although somewhat discolouring the crop. A careful examination of the injured plants revealed the fact, most apparent on the beans, that only the outer leaves, and generally the lowermost spreading leaves, were discoloured, the buds remaining green and intact. It must, of course, be a

considerable check to the plant, and must not be carried too far; but experience shows that a great point in getting the upper hand of charlock is to carefully prevent every plant from shedding its seed, unsparing of a little extra expense over the course of some few years, and particularly paying attention to those fields carrying spring-sown corn, in which it sheds its seed before the corn is harvested.

Space will not allow of adequate reference to the many other interesting points shown by the experiments. Upon tares and beans the lesson is much the same—viz., that better effects are obtained by the use of a solution of moderate strength applied carefully in considerable quantity. The discoloration of the crop was more marked upon beans than upon either tares or oats. Although too early to draw very definite conclusions, it may be said that the above quantities may be:—For tares, a 2 per cent. solution sulphate of copper applied at 50 gallons per acre. For beans, a 3 per cent. or 4 per cent. sulphate of iron at 50 gallons, or preferably a 2 per cent. or 3 per cent. of copper sulphate at 75 or 50 gallons per acre respectively.

AN IMPORTANT POINT

is to spray every portion of the upper surface of the plant. This can be done by thoroughly dissolving the iron or copper sulphate in water free from any suspended matter, and using a machine fitted with an efficient pump and a good nozzle. In addition to the knapsack machines there, Mr. Strawson brought down his new charlock destroyer, which covers a width of 24 feet with its movable arms, which can be folded to pass through a gateway. The price of this is £8, or 30s. under the ordinary cart sprayer. As, however, the latter, although taking a somewhat smaller width, is fitted with adjustable nozzles for underleaf work, by means of which it can be used for any other spraying work, such as potato spraying, together with other accessories, the latter machine can hardly be superseded by a special form for spraying charlock alone. It will be noted that, for spraying charlock, top nozzles only are required.

The "Twinspray" machine was also demonstrated with, which gets over the difficulty with the otherwise excellent knapsack form, of spilling the solution down the operator's back.

Many of those present testified to the clearly defined results which they had witnessed of the effects of the method. Some few were inclined, upon first sight of the blackened crops, where the dose had been too strong, to shut their eyes to the expectation of practical benefits to be obtained from the method in its more careful application. Such persons are always to be found. They are, perhaps, a necessary accompaniment to anything new. The pity is that they are sometimes a stumbling-block to others. For those, however, who took care to examine and weigh the results of the various applications without prejudice, great satisfaction was to be found that they had personally seen the good effects of a process which promises such a saving of labour, and the best methods of working which will be more clearly defined in the future.

COMPARATIVE COST OF WHEAT-GROWING IN ARGENTINA AND IN QUEENSLAND.

ARGENTINA, in South America, will probably prove to be Australia's greatest rival in the production of wheat. The great question of labour does not trouble the wheat farmer of South America. He can get peons in any number for £20 a year, with rations, which an Australian farm labourer would not look at. In Queensland, the farmer cannot get labour at less than, at least, from 15s. to 20s. a week, with good solid rations.

Now, it will be of interest to note the comparative cost of producing, say, 160 acres of wheat in the two countries.

We set out on the basis of 17 bushels per acre, which was about the average yield last year (1898-99) in the Argentine and in Queensland, and then commence our comparison with the price of land. We shall, however, not

include this in the expenditure on the crop. Suffice it to say that the Argentine farmer can purchase 50 squares (200 acres), within 124 miles of a shipping port, at 50 dollars per square (or £5 for 4 acres). The Queensland farmer pays, say, £3 per acre, but the payment extends over twenty years, thus making the purchase of his land a very light burden on his income. We will consider the land purchase question later on.

Let us suppose that two farmers have purchased land—one in Queensland, the other in Argentina. The following figures will give a fairly accurate idea of their expenditure, returns, and financial position at the end of their first year's operations. We assume that there has been a fairly good season in both countries :—

| | Queensland. | | | Argentina. | | |
|--|-------------|-----|-----|------------|----|----|
| | £ | s. | d. | £ | s. | d. |
| Cost of outfit for the farmer, including house, ploughs, harrows, drays, reaper and binder, horses, cows, pigs, poultry, &c. ... | 200 | 0 | 0 | 200 | 0 | 0 |
| ESTIMATED COST OF PRODUCING 160 ACRES OF WHEAT. | | | | | | |
| Expenditure of family for groceries, clothes, &c. ... | 42 | 0 | 0 | 42 | 0 | 0 |
| Wages of one farm hand, including ploughing, harrowing, drilling, at 10s. 3d. per acre ... | 82 | 0 | 0 | 24 | 0 | 0 |
| Extra harvest hands (Argentina) ... | ... | ... | ... | 15 | 0 | 0 |
| Harvest work (Queensland)— | | | | | | |
| Reaping and binding, £64, at 8s. per acre } ... | 96 | 0 | 0 | | | |
| Stooking ... £8, at 1s. " " } | | | | | | |
| Stacking ... £24, at 3s. " " } | | | | | | |
| Seed ... | 32 | 0 | 0 | 22 | 0 | 0 |
| Hail insurance ... | ... | ... | ... | 13 | 0 | 0 |
| Threshing 2,933 bushels (at 1s. 8d. per 220 lb. in Argentina: at 5s. 6d. per acre in Queensland) ... | 44 | 0 | 0 | 64 | 0 | 0 |
| Bags ... | 20 | 0 | 0 | 32 | 0 | 0 |
| Provincial tax ... | ... | ... | ... | 8 | 0 | 0 |
| Cartage to railway station ... | 13 | 6 | 8 | 22 | 0 | 0 |
| Railway freight, 124 miles ... | 37 | 0 | 0 | 48 | 0 | 0 |
| Commission, &c. ... | 12 | 16 | 8 | 12 | 4 | 5 |
| Interest on original outlay for land—£250, at 12 per cent. ... | 30 | 0 | 0 | 30 | 0 | 0 |
| " " " £600, at 5 " " " ... | 10 | 0 | 0 | | | |
| Interest on cost of outfit ... £200, at 12 " " " ... | 24 | 0 | 0 | | | |
| " " " £200, at 5 " " " ... | 10 | 0 | 0 | | | |
| Allowance for depreciation ... | 10 | 0 | 0 | 20 | 0 | 0 |
| Sundry expenditure ... | 15 | 0 | 0 | 15 | 0 | 0 |
| First year's instalment on land purchase ... | 30 | 0 | 0 | 10 | 0 | 0 |
| | 674 | 3 | 4 | 601 | 4 | 5 |
| CR. | | | | | | |
| ARGENTINE. | | | | | | |
| By sale of 2,933 bushels of wheat, at 2s. 9d. ... | £403 | 5 | 9 | | | |
| Balance to Dr. ... | 197 | 18 | 8 | | | |
| | 601 | 4 | 5 | | | |
| QUEENSLAND. | | | | | | |
| By sale of 2,933 bushels of wheat, at 3s. 6d. ... | 513 | 5 | 6 | | | |
| Balance to Dr. ... | 160 | 17 | 10 | | | |
| | 674 | 3 | 4 | | | |
| Maize Crop and Sundries. | | | | | | |
| First ploughing, at 4s. per acre ... | 12 | 0 | 0 | | | |
| Second ploughing, at 3s. per acre ... | 9 | 0 | 0 | | | |
| First harrowing, at 1s. per acre ... | 3 | 0 | 0 | | | |
| Seed maize ... | 1 | 10 | 0 | | | |
| Planting, at 1s. 6d. per acre ... | 4 | 10 | 0 | | | |
| Harrowing twice, at 9d. per acre ... | 4 | 10 | 0 | | | |
| Disc harrowing twice, at 1s. per acre ... | 6 | 0 | 0 | | | |
| Pulling maize, at 3s. per acre ... | 9 | 0 | 0 | | | |
| Carting maize, at 2s. 6d. per acre ... | 7 | 10 | 0 | | | |
| Husking and threshing, at 1½d. per bushel ... | 15 | 0 | 0 | | | |
| 600 bags, at 5d. ... | 12 | 10 | 0 | | | |
| Drawing to railway station, at 3s. 6d. per acre ... | 10 | 10 | 0 | | | |
| | 95 | 0 | 0 | | | |

| | | | | | | Queensland. | Argentina. |
|---|-----|-----|-----|-----|-----------|-------------|------------|
| | | | | | | £ s. d. | £ s. d. |
| Cr. | | | | | | | |
| By sale of 2,400 bushels maize, at 3s. per bushel | ... | ... | ... | ... | ... | 360 0 0 | |
| „ Pumpkins | ... | ... | ... | ... | ... | 100 0 0 | |
| „ Sundries... | ... | ... | ... | ... | ... | 60 0 0 | |
| | | | | | | 520 0 0 | |
| „ Sundries... | ... | ... | ... | ... | ... | ... | 57 0 0 |
| Less cost of maize production | ... | ... | ... | ... | £95 0 0 | | |
| Dr. balance on wheat | ... | ... | ... | ... | 160 17 10 | | 197 18 8 |
| | | | | | | 255 17 10 | |
| Cr. balance | ... | ... | ... | ... | ... | 264 2 2 | |
| Dr. balance | ... | ... | ... | ... | ... | | 140 18 8 |

It will be seen that there is not a large margin of difference between the cost of producing a first crop of wheat in either country. The difference of £72 18s. 11d. in the expenditure from start to finish at the seaport market, may be set down to extra labour, so that, practically, the cost in both cases may be said to be the same. Here, however, the equality ceases. We find that the yield at the rate of about 17 bushels per acre (as given in the Argentine statistics) is 2,933 bushels, although at 17 bushels per acre the yield should be 2,720 bushels. However, for purposes of comparison we will accept the former yield. For this the farmer in the Argentine obtains about 2s. 9d. per bushel. The Queenslander sells at 3s. 6d. per bushel, and when the crop is finally disposed of the Queenslander finds himself £37 0s. 10d. ahead of the Argentine farmer, and to come out clear at the end of the year, or even at the end of fifteen months, the latter has to make up £197 18s. 8d., and the former £160 17s. 10d.

According to the excellent statistics of Mr. William Goodwin, an eminent authority in Buenos Ayres, we learn that the total return from extra crops of maize, sale of calves, poultry, &c., together with the net earnings of the colonist in the Argentine by ploughing and carting when not employed on his own land, amounts in all to £57. Here it is where the Queensland farmer outstrips his South American rival.

When the wheat harvest is over, say in December, the farmer at once ploughs up the stubble and gets in a crop of maize, not perhaps on the whole 160 acres, but, say, on 60 acres. Amongst the corn he sows pumpkins. It seems that this after-crop is not obtainable by the Argentine farmer, or his additional return would be more than £57 all told. Now the yield from this maize crop, which may be off the ground in time for sowing late wheat, or, if not, to be laid down in lucerne in July or August, will, at a low average, amount to 40 bushels per acre: 60 acres, at 40 bushels per acre, are 2,400 bushels. The sale price being 3s. per bushel, his gross return is £360. But this is not all. The pumpkins must be reckoned an asset worth at least £100, whether sold or used for feeding dairy cattle and pigs. Furthermore, the Queenslander can sell, say, 6 calves, 12 pigs, 100 dozen eggs, 1,000 lb. of butter, besides, perhaps, some honey, vegetables, poultry, which will bring in, say, £60 during the year, not counting a possible sale of wheat, straw, and chaff.

Now the two accounts show the Argentine farmer to have still to make up £140 18s. 8d., whilst the Queensland farmer has placed to his credit in fifteen months £264 2s. 2d., which will carry him over his next year's expenditure. Both, however, still owe respectively £570 and £240 on the purchase money of the land.

Summarising the above, it will be seen that the Queenslander has expended £769 3s. 4d., and has realised £1,033 5s. 6d., leaving a credit balance of £264 2s. 2d. after clearing off his liability of £160 17s. 10d. on his wheat crop. The Argentine farmer has expended £601 4s. 5d., and has realised £460 5s. 9d., leaving a debit balance of £140 18s. 8d.

It should be observed that, although no account is taken, in the Argentine cost of production, of first or second ploughing, harrowing, rolling, drilling, &c., Mr. Goodwin says that this may be reckoned at half the year's expenditure. If by that is meant the expenditure on the family groceries and the wages of the one peon, that would amount to £33 against the Queenslander's £122.

No account has been taken in either case of the cost of fencing, which is a very considerable item. Wire fencing must be used on plain lands devoid of large timber. This will cost from £25 to £30 per mile, so that £60 may be deducted from the net returns for fencing, which still leaves the Queenslander over £200 to the good, but adds considerably to the burden of the Argentine man.

There are many contingent expenses in the shape of repairs to fencing, implements, losses in stock, and partial failure in crops to face; but with a good season at the start, the Queensland farmer may be considered well off, if at the end of the year, with his land cropped and stocked as above indicated, he has 200 acres fenced, 160 acres under the plough, his house, his horses, and other stock and implements clear, and £150 or £200 in the bank to carry him through the next year.

Two hundred pounds may seem a small amount to set down for house, stock, and implements, but the first house a new settler builds on his farm need not cost more than £50. The rest—consisting of 4 horses, 2 ploughs, 1 set harrows, roller, dray, harness, 6 pigs, sundry small tools, and finally a reaper and binder—will, if judiciously bought, not bring the total to much more than stated, if even to so much.

WHEAT-GROWING IN THE VICTORIAN MALLEE.

MR. PETER KELLY, of Cannam, in the Victorian Mallee, writing to *Farm and Dairy*, gives his experiences in the way of the cost of wheat-growing as follows:—

Last year I produced 1,300 bags of wheat from 600 acres, giving an average of $8\frac{3}{4}$ bushels per acre. This was a far better crop than many of the Mallee farmers got, and I don't know that in an average of seasons we can expect, with the best cultivation which I always give my land, more than that. It will, therefore, be of interest to show what is my net returns on that crop. They are as follows:—

| | | | |
|--|-------------|-----------|----------|
| 600 acres wheat cost, per acre, ploughing 5s., seed wheat 2s. 6d., harrowing 1s. 3d. ... | £262 | 10 | 0 |
| Stripping 600 acres, at 3s. 6d. ... | 105 | 0 | 0 |
| 1,300 corn sacks, 5s. 6d. per dozen, twine 30s. ... | 31 | 0 | 0 |
| Cleaning 1,300 bags of wheat, at 6d. ... | 32 | 10 | 0 |
| Carting 1,300 bags of wheat 12 miles to railway station, at 7d. ... | 37 | 18 | 0 |
| Shire rates, water rates, and repairing fences ... | 8 | 0 | 0 |
| Interest on value of plant, horses, wear and tear of machinery, value £300, 10 per cent. ... | 30 | 0 | 0 |
| Total expenses ... | £506 | 18 | 0 |
| Receipts, 1,300 bags of wheat at Warracknabeal, price 2s. 1d. per bushel (5,200 bushels) ... | £541 | 13 | 4 |
| Credit balance ... | £34 | 15 | 4 |

I think the balance-sheet is sufficient to show that some relief must be given to the producers of the back country, or they will have to give up very soon; in fact, large numbers have already gone away in despair on account of the bad seasons and the low prices. Nothing short of a substantial reduction—say, 30 to 40 per cent.—will do. Such a reduction would, in my case, enable me to pay the wages of an additional man for nine months out of the twelve, employ a team of horses ploughing, and give an extra production of 600 to 800 bags of wheat for the railway to carry.

WHEAT-FARMING IN NEW SOUTH WALES.

THE average cost of wheat-farming in New South Wales is as follows :—

| | | Yield. Bush. | Price. | | |
|---|------|-----------------|--------|----|----|
| | | | £ | s. | d. |
| Ploughing, sowing seed, horse-feed, &c., per acre | 12s. | 10 | 0 | 3 | 6 |
| Cost of harvesting, from stripper to buyer | 6s. | | £1 | 15 | 0 |
| | | | | | |
| | | 18s. | | | |
| Profit per acre | ... | 17s. | | | |
| | | £1 15s. | | | |

WHEAT-FARMING IN SOUTH AUSTRALIA.

| | | | | | | £ | s. | d. |
|--|-----|-----|-----|-----|-----|------|----|----|
| Rent of 160 acres, at 4s. per acre | ... | ... | ... | ... | ... | 32 | 0 | 0 |
| Ploughing 160 acres, at 7s. per acre | ... | ... | ... | ... | ... | 56 | 0 | 0 |
| Seed, 240 bushels, at 1s. 6d. | ... | ... | ... | ... | ... | 18 | 0 | 0 |
| Sowing and harrowing, at 1s. 6d. | ... | ... | ... | ... | ... | 18 | 0 | 0 |
| Cost of harvesting 2,720 bushels, at 3½d. per bushel | ... | ... | ... | ... | ... | 39 | 13 | 4 |
| Carting and railage to market, at 3d. per bushel | ... | ... | ... | ... | ... | 34 | 0 | 0 |
| Bags | ... | ... | ... | ... | ... | 20 | 0 | 0 |
| | | | | | | £217 | 13 | 4 |
| Profit | ... | ... | ... | ... | ... | 258 | 6 | 8 |
| | | | | | | £476 | 0 | 0 |
| | | | | | | | | |
| Yield, 17 bushels per acre, 160 acres = 2,720 bushels, | | | | | | | | |
| at 3s. 6d. per bushel | ... | ... | ... | ... | ... | 476 | 0 | 0 |
| Less Expenses | ... | ... | ... | ... | ... | 217 | 13 | 4 |
| | | | | | | £258 | 6 | 8 |

If we add, as in the case of Queensland and Argentina, £42 for groceries, clothes, &c., and £200 for outfit, we arrive at a profit for the first year's operations of £16 6s. 8d. on the wheat crop. Fencing and clearing, of course, are not included.

WHEAT-FARMING IN DAKOTA (U.S.A.)

In the beginning of the year the *Rural New Yorker* described and illustrated the methods adopted by a Dakota wheat farmer as being a good example of the district. The cost of cultivation from first to last, using the most modern implements, is set down at 3s. 1½d. per acre; seed, 2s. 1d.; interest on the value of the land, 3s. 1½d. Other expenses bring the total cost of producing a crop to 12s. 5d. per acre. The yield was 6 bushels per acre, which brought 12s. 6d.; so that the crop only paid working expenses. Comparing this with the other countries we have considered, it would appear that by farming 160 acres he would have realised only £8, but, as he did much of the work himself, he reckoned his crop paid him good wages.

The Late Exhibition as a Factor in Education.

ON the surface it may appear to some that the Annual Exhibition of the Queensland National Association is merely an excellent opportunity afforded to those living away from the capital, either in the North or West or in the surrounding agricultural districts, to meet each other and enjoy social intercourse amidst pleasant and congenial surroundings. Even were this all, there is much to be said in favour of the annual gathering, for where many hundreds of rural dwellers are gathered together, and interchange ideas, good must inevitably result. Men, and also women, and even the youth carry back to their homes ideas which, but for such an opportunity, would never have entered their heads.

But there is another, a higher and broader, view to be taken of the value of the Exhibition.

Comprehensively, the visitor obtains a good general idea of the rural economy and often varied resources of the colony as a whole. This is, in itself, an education. It is not alone, however, sufficient that the residents should be enlightened as to the colony's capabilities, but visitors from other colonies and from distant countries are brought face to face with our products and manufactures, and thus the latter are advertised all over the civilised world.

It is in a great measure due to the various shows held in different parts of the colony that new industries have arisen. Large areas of land have been placed under crops which were previously grown in a small way in gardens or on small farms. The unceasing exertions of the Department of Agriculture are constantly bringing into prominence new products of the soil, which the farmer and horticulturist see for the first time at some show. They try them, and the product is one more item added to our list of market produce for local consumption or for export. Consider coffee, rice, cow-pea, the new grasses! Run your eye over the stock pens on a show ground, and then try and remember the condition of agriculture thirty years ago, when shows were few in number, and its position to-day. The implements alone show what a revolution has taken place in the methods of cultivation of the soil and harvesting the products thereof, in the washing and shearing of sheep, in the manufacture of sugar, and in a variety of other ways.

It was a very happy inspiration which brought district exhibits into prominence at Bowen Park. These amply demonstrate the capabilities of each district represented, from their larger productions to the humblest to be found in earth, air, and water. Ask an average person where coffee, rice, sugar, and tobacco are grown in Queensland. His mind instantly reverts to the tropical portions of the colony, and he will probably reply: "Oh! away up the Far North somewhere." Yet, when the resources of the Southern and temperate parts of the country are placed before him, he finds to his astonishment that these things are produced there, as well as in the North, on a commercial scale. Thus the Exhibition has the effect of teaching the people, and of teaching strangers to the colony, something that they never knew before, and may, in some cases, have the wide-reaching effect of being the means of inducing the investment of capital in industries not previously known to be capable of introduction or expansion in certain localities.

So impressed are the Californians with the importance of displaying their products in exhibitions, that they take endless trouble to show their raw products and the same classes of produce, manufactured, tinned, packed, and generally put up in many attractive ways. And this work has been done so effectually that it is said that as a result of Californian exhibition work 50 per cent. has been the increase in the trade of her products during the last fifteen years, all attributable to the various exhibitions held in the country.

Dairying.

ARTIFICIAL BUTTER AND GERMS.

THE Berlin correspondent of the *Times*, writing on the above subject, says:—

"In view of the international congress on tuberculosis, it is not without interest to note certain experiments which have been carried out recently. Milk is well known as one of the most dangerous carriers of the germs of tuberculous infection, and the same is no less the case with butter, with this additional disadvantage—that no means have yet been discovered of sterilising the latter without destroying its flavour. Even margarine is not wholly free from danger, because a certain amount of milk has always to be employed in its preparation. To obviate these dangers, attempts have recently been made here, at the suggestion of Professor Liebreich, to substitute an emulsion of almond paste for milk in the manufacture of artificial butter. The resulting substance in taste, colour, and consistency exactly resembles ordinary butter, and, besides being absolutely free from all possibility of infection, keeps fresh very much longer than butter, and only costs half as much. Not only almond but any kind of nuts could be used in the manufacture of this substitute. It is probable that attempts will be made to produce almond butter on a large scale."

Very *à propos* to this, we find an article on pea-nut butter in the *Tropical Agriculturist*, Ceylon, extracted from the *Chemical Trade Journal*, to the following effect:—

PEA-NUT BUTTER.

It is reported in an American journal that a new factory has just been put in operation in the city of Kokomo, Indiana, for the manufacture of butter from pea-nuts. At the present price of the nuts the butter can be sold at 15 cents per lb. The process of manufacture is no secret. The nuts, after the hulls are removed, are carefully handpicked, and faulty kernels removed. They are then roasted in a large rotary oven. Again, they are gone over by hand for the removal of scorched grains. The nuts are then put through a mill and ground as fine as the finest flour, the natural oil in the grains giving it the appearance and consistency of putty as it leaves the mill, except that it is more of an orange colour. By the addition of water, the butter is complete, no other ingredient—not even salt—being used. It never grows rancid, and keeps in any climate. If this butter is all that it is said to be, it would seem that sooner or later the ordinary dairies will have to cease business, but much must be allowed for American enthusiasm in heralding this new butter substitute.

LAMB TROUBLES.

COLIC AND HOVEN.

WHEN the milk or food does not agree with lambs, they may have colic, instead of, or before, scouring. They are observed to get up and down frequently, or found stretched out at length upon the ground. Some strike at the belly with the hind feet, while grinding of the teeth is a common symptom.

"Cades," "cadies," or "hobbed" lambs are naturally the most frequent sufferers, as the milk of any other species of animal is less likely to agree than that of their own dams, or a foster-mother from the flock. The sudden change, when weaned, is a time when colic may be feared, and among lambs allowed to eat grass grown under trees. The writer once lost a most valuable lamb from the latter cause, after partially educating him as a performer. In his case, a child led him to eat grass under some beech-trees, and most readers know that nothing can grow under them of any use, except it is wood pigeons, searching for mast, while waiting for the farmers' peas to come up.

The pain of colic is often so acute that a delicate lamb will succumb before a purgative can take effect, so that it is well to give a cordial dose of sweet nitre and peppermint, with a little laudanum or gin added to allay pain, and followed quickly by a dose of castor oil or salts, with ginger and capsicum or gentian. The trouble is likely to recur unless the bowels are acted upon, as in all the gastric troubles there is curdled material to be got rid of.

"Hoven," "blown," or "blast," is a complaint known by a variety of different names, but readers will probably recognise the disorder to which we refer.

THE CAUSE.

Fermentation of the food contained in the first stomach (rumen), is the cause. A greater amount of gas is eliminated than the animal can expel, either by eructation or rectal flatus. It is not often we see it in very young lambs, but, after they have been changed from dry to moist food, quickly-grown clover, or other succulent food, with which they fill themselves rapidly. To prevent this, they should not be put on it until nearly satisfied with the food they have been having previously.

The symptoms are distension of the abdomen, especially on the left side, standing with legs apart, and apparently afraid of falling down, the breathing hurried and difficult, while the countenance can only be described as haggard.

The claim has often been made for certain remedies, that they would decompose the gases, so that, from a great bulk, a small amount of some harmless salt in solution would be produced, and the distention, of course, immediately got rid of, but none of them are to be depended upon. It is a fine idea—a truly scientific one—but the gases to be dealt with are not always the same, or, at any rate, do not undergo the conversion inside the animal that they will in a chemical apparatus. We are thrown back upon the old remedy of linseed oil as one of the best, since it has the undoubted property of masking the gas as fast as produced, and thus enabling the digestive apparatus to get rid of it, if not already too greatly distended to act. In this connection it may be said that for adult ruminants it is still the best remedy in ordinary cases.

PUNCTURING THE SIDE.

Where the patient is *in extremis*, there is not time for any drug to act, and no choice but to puncture the side—the left side, be it remembered—and the place to be chosen, midway between the last rib and the hip. The instrument used should be thrust in in a direction downward, and slightly forward, to avoid injuring other structures.

There are very nice instruments made for the purpose, but not usually found in the possession of farmers, while the veterinary may not be summoned in time. It may be remarked, *inter alia*, that this is one of the cases in which the importance of messages are demonstrated, it being no use to telegraph, "Very bad; come at once," if you don't say what is the matter; and if you do say, "Blown; urgent," he will bring what is wanted. In the part of the country from which I write (I'm not chained up at the back of 6, Essex street, like the tame authors we read of), the farmers improvise a canula by cutting a stick of alder, and pushing out the pith; they then make an incision with a clean knife, and introduce the extemporised instrument, and let off the gas. It may be advisable, in cases of some standing and persistence, to add a few drops of carbolic acid, as it prevents decomposition of retained food, which might otherwise be got rid of without further trouble. A proper canula has the advantage of being left in the orifice without danger of slipping inside, but the crude instrument referred to must be held until the apparently inexhaustible gases have escaped. The belly goes down like a pricked balloon, and the breathing becomes natural almost at once. When it is found that there is a tendency to refill when the instrument is withdrawn, some small doses of hyposulphite of soda or chlorinated lime are recommended, but the oil advised has in the meantime had opportunity of giving relief both as a gas-destroyer and aperient, inducing the expulsion of wind per rectum.

After an attack of this kind, the animal should receive special care until digestion is completely restored.

INFLAMMATION OF THE KIDNEYS OR NEPHRITIS.

Badly wintered ewes are apt to give birth to lambs predisposed to the above disease, and such youngsters die off in two or three weeks. No measures of a remedial character are of any avail, and the subject is merely referred to here as a warning.

WOOL BALLS.

These occur for want of clatting at the proper time, or else from the lambs biting at ticks or scab. An autumn dip is seldom money wasted. The symptoms are dullness, giddiness, loss of appetite, collapse, and death; and remedies are not often of much avail. True, it is sometimes found that repeated doses of oil dislodge the balls, and it may be worth a trial, but prevention is comparatively easy, and at all times better than cure.—“Vet.,” in *Farmer and Stockbreeder*.

ESTIMATING ACIDITY IN MILK.

By C. W. TISDALE DAVIES, F.C.S.

THE HOT IRON TEST.

THIS test—originally American, I believe, and very accurate sometimes—is not based on any well-defined principle, but, being simply conducted, and usable by novices at the work, has a large circle of admirers and adherents. The iron to be used—or, better, steel—is about $1\frac{1}{4}$ -inches wide and $\frac{1}{4}$ -inch in thickness, length being some 6 inches, set in a wooden handle. It is heated in the fire to red heat, and allowed to cool just enough so that the redness disappears, and it looks black. Of the curd, which is at this time maturing on the cooler preparatory to the grinding process, a little block is taken of about 1 inch square, and squeezed in the hand to free from as much moisture as possible; it is then introduced to the face of the hot iron, to which it sticks, and the iron is moved gently away, when fine strings of curd will be noticed.

The cheesemaker judges the amount of acidity present by the length of the curd strings. For instance, curd ready for grinding in the Cheddar process will produce strings of from 1 inch to $1\frac{1}{4}$ inches in length. If the strings are not long enough, the curd is covered up again and left to further acidify. Attention should be paid to the kind of strings the curd produces. They must be extremely fine and thread-like, and not thick and elastic, which latter do not indicate anything in particular.

Professor Babcock has experimented with the hot iron test, and found that no definite relation exists between it and acidity, although it may be generally taken that long strings are associated with high acid. To prove this, he has shown that sweet curd which will not string at all can be made—by pouring over it some alkali, such as borax, phosphate of soda, or bicarbonate of soda—to string as if it were highly acid. In fact, the hot iron test is one which is suitable to indicate maturity of curd, inasmuch as any substance—lactic acid, alkalis, &c.—which has a slightly solvent action upon it, causes it to string.

It must, therefore, be understood that, although lactic acids assists stringing, there are other causes at work, and that mature curd which strings properly is conditioned by the peptonising or digestive action of other ferments in addition to what the lactic acid has done to help.

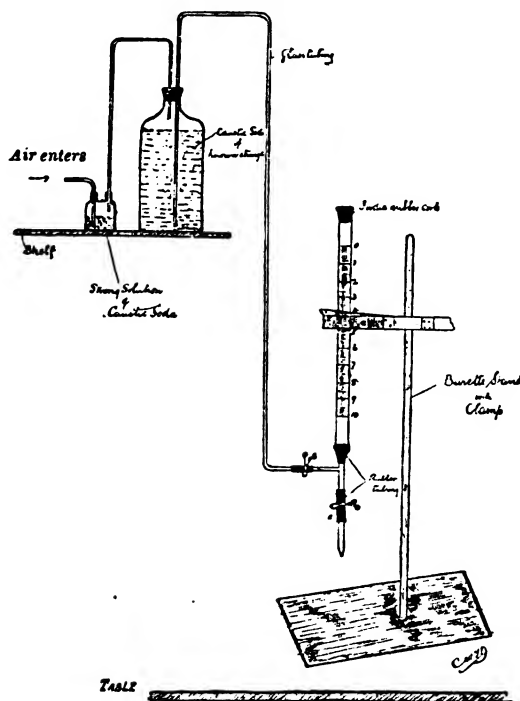
THE ACIDIMETER.

The next test, and the best of all—being, as it is, absolutely accurate, and now commonly known as the acidimeter—depends on the simple chemical means of titrating an acid solution with an alkali, or *vice versa*, to determine (volumetrically) the percentage of one in a given solution. Now, although this

method is common in the analyst's laboratory, no one seems quick to take it up, or, rather, think of introducing to the practical dairy. Dr. Bond, of Gloucester, was, I believe, the first to suggest its adoption.

The requirements are certainly some kind of apparatus—a pipette, small porcelain, &c.—but need not run into a great deal of money unless the reader prefer it that way. The simplest form of all the apparatus one can have is simply a burette for measuring, a bottle of caustic soda of definite known strength, porcelain dish, pipette, glass rod, and indiarubber cork, costing in all some 4s. or 5s., the solution of phenol-phthalein (soda solution) being extra. This method, of course, will do, and will answer fairly well; but the great disadvantage is that in pouring the caustic soda each time of using into the burette causes it to lose strength. If this way be adopted, great care must be used in keeping both the bottle and the burette (if any soda is left in it) corked—the former with a glass and the latter with a rubber cork.

Where, however, the test is largely resorted to, it is much better and more satisfactory to rig up an apparatus similar to the one I have drawn, the whole affair costing, if you construct it yourself, only 2s. or 3s. more.



CONSTRUCTION.

To the ingenious it forms interesting work, and with plenty of glass tubing (which can be bent to any shape in an ordinary gas-burner), together with some bits of rubber tubing, it is soon rigged up. The T-piece, however, had better be bought, as it lies outside the ordinary amateur's work. It would be best here to make a remark or two on how to construct the apparatus.

The first bottle required I have represented in diagram as a Woulfe bottle, but an ordinary small bottle and rubber cork, with two holes to admit the glass tubing, will do admirably. This contains a strong solution of caustic soda, and is used for drying and purifying the air before it is passed into the bottle with solution of known strength, which it would weaken without this preparatory drying.

The next bottle may consist of an ordinary Winchester quart—which, by-the-by, holds half-a gallon, for what reason one is unable to say; but it is safe to assume that down in that neighbourhood they are not so liberal as to sell spirituous liquids by the above measure. The burette, or measuring tube, itself is held by an ordinary wooden clamp. It is now particular to notice the position of the glass tubing, which is most important. Firstly, where the air enters it goes right into the soda solution. The other tubing must not touch the solution in the Winchester quart bottle. The next lot of tubing, however, must go right to the bottom of the solution, which it is to conduct to and fill the burette with.

Clearly notice this: The first bottle does not supply anything to the burette, but absorbs the water and carbonic acid of the air, which would alter the known strength of solution in the Winchester quart bottle. The carbonic acid tends to turn the caustic soda into carbonate, thus using up the strong alkaline properties of the former. Perhaps it would be best to add that the small bottle of soda solution, after doing its work for some considerable period, gets used up and becomes acid, and therefore not performing its necessary functions. It is therefore advisable to always colour it with a little phenol-phtalein, which gives it a strong pink tinge, and tells you at once to renew the soda when that colour disappears.

The two bottles containing the solutions it is essential should be placed on some shelf above the burette, so that the syphon principle can act easily. To fill the burette, all that is necessary is to squeeze the spring cock B. To those desirous of obtaining this apparatus, and not inclined to take the trouble of constructing it themselves, it can be bought ready for fitting up at one firm of chemical apparatus maker's.

PERFORMING THE TEST.

Fill up the burette to the 0 mark, taking out, of course, the india-rubber cork, and replacing when not using the soda. Now, the soda is of such a strength that 1 cubic centimetre is capable of neutralising exactly '01 (100th) of a gramme of lactic acid.

A burette, it may be well to know, is usually graduated into 10 or 20 parts, as the case may be, each of which is again divided into ten divisions, small truly, but easily discernible.

Our liquid to be tested—such as cream, milk, whey, &c.—is now brought upon the scene, and a pipette capable of measuring out 10 cc. is used. It is best always to rinse out the pipette with the liquid you are about to test, which gives greater accuracy. After measuring out the 10 cc. (a mark on the pipette denoting how full it should be), it is put in a small white porcelain basin.

Phenol-phtalein, an indicator derived from coal-tar and dissolved in alcohol, is next added to the 10 cc. milk or cream, two or three drops being sufficient. This phenol-phtalein, kept in a dropping-bottle for convenience, has the properties of turning pink in an alkaline solution, but remains colourless in the presence of acid. It is the most valuable of indicators for this purpose, as others fail to answer as well.

The dish with milk is now put underneath the burette, and by pressing spring cock A the caustic soda runs in very gently—best in drops. The liquid up to this time is colourless, but when a certain amount of the soda solution has been run in it turns slightly pink. The more added, the deeper the colour. Stop as soon as the faintest trace of pink appears, and read off the burette how much soda has been used to neutralise the acidity in the milk. Suppose two large and one small divisions have been used, then, as 10 cc. of milk have been taken, each cc. on the burette is equal to '1 per cent. of lactic acid, or the two large and one small divisions indicate '21 per cent. acid (reckoned all as lactic), or the percentage which would be present in ordinary cheese-making milk.

If ten whole divisions were used, then it would indicate 1 per cent. acid, or the amount likely to be found in a starter of sour whey. In dropping the soda into the solution when testing, it should be stirred all the time with a piece of glass rod to ensure proper mixing taking place.

Its value to dairy folk cannot be over-estimated. Firstly, in butter factories the cream when ripening can be tested as to its fitness for churning, and by this means a uniform product always turned out. The amount of lactic acid present in ripe cream should be about '5 or '6 per cent., according to the tastes of the butter-maker. Milk coagulates when '75 per cent. acid is present.

It has been pointed out by one writer that in the dairies where this test has been adopted the average value of the cheese produced has been raised some 10s. per cwt., which is not at all unlikely.

Cheese-makers should test the acid in the milk to begin with, which gives a good idea as to the fast or slow cheese likely to result, and shows in what instances starters are advisable. Test the whey when it is ready to be drawn off, and see if sufficient acid is present. Again, test whey running from the cooler when curd is thought ready for grinding, and finally test that squeezed out when the cheese is pressed. By this means you can control the working with greater facility. As to what amounts one is likely to expect, take

CHEDDAR CHEESE.

Acid in milk, '23 per cent.; acid in whey on cutting, say '15 per cent.; ditto, drawing, '18 to '2 per cent.; ditto, drained from cooler, '7 per cent.; ditto, from press, '9 to 1 per cent.

Other varieties of cheese show slightly different acidities, but it would be here out of place to dwell on such.

Stilton cheese applies itself to this test, as, indeed, all dairy liquids. The cheese-maker is particularly handicapped when there is a taint in the milk, and his senses are unable to detect the acidity or how the cheese is progressing. Not so the acid test; it is no respecter of persons or things, and works just the same.

Apply, then, this test in conjunction with your others, and see the results. Suppose a particularly good cheese is made on such-and-such a date, and acidities as taken recorded in a book, with other notes on curd, &c. You are then able to refer back and make other cheeses on the same system, most probably with like results.—*Farm and Stockbreeder.*

SHEEP-BREEDING IN ARGENTINA.

At the time of the conquest of Peru there already existed in that country a breed of sheep which were much esteemed by the Incas. They were shorn once a year. In 1539 the first sheep were introduced from beyond the Cordilleras; and in 1550 Juan Nunez del Prado invaded Tucuman, and brought with him a flock of sheep from Peru. In 1587 Don Juan Torres de Vera y Aragon introduced 4,000 Spanish sheep from Peru, and it was these sheep which were the originals of the countless thousands which wandered at sweet will over the broad expanse of the Pampas. All uncared for and neglected, they multiplied and increased for wellnigh two and a-half centuries. About the end of the 16th and 17th centuries sheep were then worth from 6 to 8 silver dollars a head. Two centuries later they were worth 4 reals (about 2½d.), which clearly proves the enormous increase in the flocks. Very little lamb was used as food. Beef and cereals were in general use in the Argentine. The amount of cattle in the country was calculated at 48,000,000 head. The wool of the sheep was long, weak, and coarse, and was produced in small quantity, amounting generally to 1½ lb. per fleece, whilst many epidemics attacked the flocks of the settlers.

Wool was first exported from the Rio de la Plata in the year 1600 A.D. The shipment amounted to but 97 arobas, or 2,425 lb. Spain was then the only outlet for wool, and sheep were neglected and despised, being classed as wild beasts; they were looked on as public property, and roamed at will.

At the beginning of the present century they were of a poor type, bearing a miserable fleece. They were of two classes: The Pampas sheep as distinct from the long-woolled merino sheep from Spain; and the Criollo, descended from the Spanish merino, but these were so degenerated as to resemble in little the latter in either wool or type. The Pampas sheep was leggy, with a white face, bare about the neck and belly, sometimes with four and even six horns, hardy and prolific, and bearing long weak wool with no yolk. The Criollo was a smaller animal, many being black or brown, thinly boned, with a shaggy hairy growth on the neck that had the appearance of a mane; the wool was mixed with hair, and was generally of a sort of reddish colour.

There is no need to follow the whole history of the progress of wool-growing in the Argentine.

In 1797 Captain McArthur, of New South Wales, was an enthusiastic sheep-breeder. In 1803 he owned a flock of 4,000 merino crossbred sheep. In 1824, so successful had been his private enterprise in Australia, that a company on a large scale was formed, and shares rose to the fabulous price of £5 each. Still, the Argentine people held sheep in no esteem, and in one case whole flocks were driven to the seaside, where many were precipitated over the cliffs into the sea, thus reducing the flocks to what was considered a convenient number.

The cross between the new imported merino and the native Criollo was termed a "mestizo," and this term prevails to the present day.

It is only since 1866 that the sheep industry in the Argentine may be really said to have started into life. From 1856 to 1866 the stock of sheep has bounded from 16,000,000 to 90,000,000, thus surpassing that of Australia, and at a later date only reached 84,000,000. The Australian sheep averaged 5 lb. per fleece for the total stock, whilst that of Argentina barely reached 3 lb. for the same year, 1886. Since that year the improvement has gone on, and the return for 1891 showed an average of 4 lb. per sheep on 78,000,000.

Admitting that a cow consumes as much forage as 5 sheep, and the horse as much as 7 sheep, then the natural pastures of Buenos Ayres maintain stock at the rate of 186 sheep per 100 acres per annum. No such great live stock bearing territory can be shown in any other part of the world. Land in Buenos Ayres will carry $2\frac{1}{2}$ sheep to the acre in addition to 1 cow per 5 acres, and this without the aid of artificial feeding.

Well-bred mestizo sheep will average $6\frac{1}{2}$ lb. of wool in the grease, washing out to from 35 to 40 per cent. Lincolns will run from $7\frac{1}{2}$ lb. to $8\frac{1}{2}$ lb. of wool per head.

Now, to give our readers some idea of the carrying capacity of land in the Argentine, we append a few statistics relating to the stock carried on some of the sheep ranches in that country:—

VENADO ESTANCIA.

One hundred and twenty miles from the city of Buenos Ayres.

Area: 19,760 acres.

Stock: 20,000 sheep, 3,000 cattle, 300 horses.

Equal to 2 sheep per acre.

SAN FELIPE.

Two hundred and fifty miles south of the city of Buenos Ayres.

Area: 42,640 acres.

Stock: 50,000 sheep, 9,250 cattle, 1,400 horses.

Equal to 2.40 sheep per acre.

ESTANCIA NEGRETTI.

Eighty miles south of the city of Buenos Ayres.

Area: 27,300 acres, divided into 30 paddocks.

Stock: 35,000 sheep, 7,500 cattle, 1,800 horses.

Equal to 3.12 sheep per acre.

Of these sheep, 30,000 are Leicesters, 3,500 Rambouillets, 500 Lincolns, 1 Negretti, 1 Rambouillet stud flock.

The rams of the latter class give from 16 lb. to 32 lb. weight of fleece.

Negretti stud rams from 24 lb. to 34 lb.

ESPARTILLA.

Area : 40,000 acres.

Stock : 54,000 sheep, 8,000 cattle, 1,900 horses.

Equal to 2.50 sheep per acre.

DOS HERMANOS.

Area : 22,724 acres.

Stock : 45,000 sheep, 5,000 cattle, 500 horses.

Equal to 3.24 sheep per acre.

The sheep consist of 30,000 Rambouillet merinos and 15,000 Lincoln crosses. The average wool return is 4.84 lb. on 45,000 sheep.

LA ISABEL.

Area : 15,067 acres.

Stock : 20,000 sheep, 3,400 cattle, 750 horses.

Equal to 2.80 sheep per acre.

The average wool yield on 13,000 Lincolns is 5.64 lb.

The average wool yield on 7,000 Rambouillets is 5.21 lb.

MANANTIALES.

Area : 14,173 acres.

Stock : 10,600 sheep, 4,200 cattle, 800 horses.

Equal to 2.62 sheep per acre.

TRECE DE ABRIL.

Area : 40,014 acres.

Stock : 5,000 sheep, 10,500 cattle, 1,600 horses.

Equal to 1.71 sheep per acre.

N. CASTELLA.

Area : 49,400 acres.

Stock : 10,000 sheep, 4,400 cattle, 1,200 horses.

Taking the above four properties, we find that—

La Isabel, with 20,000 sheep, gives an average of 5.40 lb. of wool.

Manantiales, with 10,600 sheep, gives an average of 4.82 lb. of wool.

Trece de Abril, with 5,000 sheep, gives an average of 5.97 lb. of wool.

N. Castella, with 40,000 sheep, gives an average of 4.51 lb. of wool.

The wool fetches, all round, 5½d. per lb. in the Buenos Ayres market.

A gentleman now resident in Brisbane was, a few years ago, head shepherd on an estancia, some 600 miles west of Buenos Ayres city and west of Rosario. The estate was 150,000 acres in extent. On this were depastured 250,000 sheep and 20,000 horses. The sheep were principally crossbred Lincolns and Rambouillets. Every year the lambing season was productive of 100,000 lambs. The fleeces ran from 25 lb. to 35 lb. The carrying capacity of the land was from 2½ to 3 sheep per acre. There were no cattle on the estate, but the horses were periodically run in, and their manes and tails were cut for the sake of the hair, and many of the mares were killed for their skins and grease. During the months from October to February, he says it is a marvel that the sheep live. There is no grass to be seen anywhere, the only green food being the coarse grass and rushes growing on the edges of swamps. At the end of the dry season the animals are so poor that a man could carry five or six of them at once. As soon as the rains begin, the grass and herbs spring up like magic, and sheep, cattle, and horses put on flesh in a very short time. One peon can look after from 10,000 to 15,000 sheep, which are not paddocked. At night they are run into corrals surrounding the shepherds' huts. Wild beasts do not interfere with them. Water (or rather the want of it) is the great trouble. Before irrigation works were established on the ranches, the sheep were watered from troughs which were filled by water from wells or from canyons. The water was drawn up by means of a whip or a whim; the full bucket coming up was emptied automatically into the trough, whilst the empty

one descended at the same time. The wages of shepherds and of peons generally ranged from 10 dollars to 30 dollars (head shepherd's pay) per month. Taking the dollar to be worth 3s., though subject to the fluctuation in the price of silver, this would mean in English currency pay at the rate of from £1 10s. to £4 10s. per month. As a rule, on a large estancia there are about 20 peons permanently employed.

In Queensland there is, at the present day, no shepherding, the sheep being all run in paddocks. But boundary riders are required, which, in point of wages, amounts to about the same thing, except that a larger number of sheep can be placed in charge of a boundary rider than of a shepherd.

The cost of managing a sheep run in Queensland is, as nearly as possible, £100 per 1,000 sheep per year; hence a run with 250,000 sheep would cost the owners £25,000 a year to carry on.

As for an increase of 100,000 lambs from 250,000 sheep, this is far in excess of our Queensland increase. On a sheep run in good working order, there will be about one-third breeding ewes, and in a good season 80 per cent. of lambs is all we can expect. In very favourable seasons the percentage will reach and sometimes exceed 90 per cent., that is, of course, on the one-third ewes of the flock.

THE PRINCIPLES OF SHEEP-BREEDING.

No. 3.

By HERMANN SCHMIDT.

MEN have originally employed the skins, and later on the hair, of animals for the purposes of clothing. Whilst the different sorts of hair are more or less suitable for that purpose, according to their length, fineness, softness, &c., they all possess, being of a horny nature, the peculiarity of being non-conductors of temperature, thus serving the purpose of, to some extent, preventing the radiation of the animal heat, and, by so doing, of keeping the animal body in comfortable temperature. In the course of time, the wild animals which yielded the most suitable skins for clothing purposes became so scarce that it became necessary to obtain substitutes for such skins. This probably led to the domestication of such animals as produced the most suitable kinds of hair—viz., vicuñas, goats, and sheep, of which the latter has become the most useful to man. Of sheep we have a very great variety. Some of them produce no wool, but short, coarse hair. These are mostly found in hot tropical countries, where clothing is not so much required as it is in cold latitudes. Hence it is here that we find sheep carrying plenty of wool. The several classes of domesticated sheep may, according to the nature of their hair or wool, be divided into—1st, those that produce hair only; 2nd, those that yield a mixture of hair and down; 3rd, those that produce down only.

Most of the uncultivated breeds of domestic sheep carry hair and down. The Lincoln, Cotswolds, &c., and the French and German country sheep carry highly cultivated hair only; whilst the fleeces of the merino may be looked upon, as I shall explain more fully directly, as cultivated down.

Taking the first-mentioned class as the progenitors of our domestic sheep—i.e., the mixed woollen ones, carrying hair and down—we have reasons to believe that the long-woollen races were developed from them through paying special attention to the perfecting of the hair, and through getting rid of the down; whilst with the merinos the opposite system has been followed—viz., the cultivation of the down, the lengthening of its staple, rendering it more dense, and by persistently culling out, year after year, animals with an admixture of hair in their fleeces, just as we do at the present day.

Considering now that the wool of a Lincoln sheep is much coarser, in the ordinary meaning of the word, than that of many other animals, the question arises: Where is the line to be drawn between wool and hair, and which are the peculiarities that distinguish the one from the other?

In the language of the breeder, we use the term "wool" for a mass of more or less fine and uniform animal hairs, the product of the skin.

Hair, properly speaking, is a tube containing a cellular mass called marrow or *medulla*; whilst a true wool hair is a solid horny rod, a matter to which I shall refer more particularly later on. In order to properly understand the nature of wool, we must study it—Firstly, from an anatomical point of view as an animal hair; secondly, as a crop to be cultivated; thirdly, as a commercial article, as judged by the manufacturer.

Looking upon a fleece of wool as a crop raised from the skin, or its field, we may call the skin of a sheep "a woolfield." In order to cultivate it intelligently, the woolgrower must understand the conditions under which this field can, in after generations, be improved as to the quantity and the quality of the crops of wool to be raised from it. We have to deal with its thickness, its elasticity, the peculiar nature of its organisation, its individual capacity for producing those elements from which the horny matter which constitutes the wool fibre is formed, and its healthy condition generally. This interesting organ exhibits, in its extreme sensitiveness, the nature of a highly developed animal organ; and in its aptitude to regenerate itself, and its capacity of being transplanted, the nature of a vegetable.

The skin or integument forms a covering over the whole body. The skins of some animals are very thin, of others very thick. Some skins are very close-grained, others are of a more spongy nature.

The skin of the mammals is made up principally of two parts—the outer one which is exposed to the air, and the inner one. Between the skin and the body of an animal, we find a whitish mass—the subcutaneous tissue which consists of a mass of fibres, bloodvessels, nerves, &c.

The outer one of the two parts of the skin is called the epidermis (or cuticle), and the lower inner part the dermis (or *corium*).

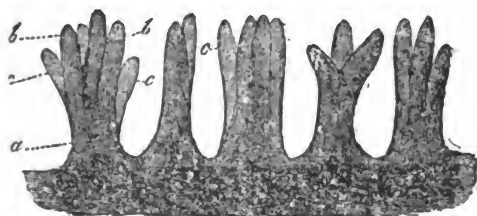
The epidermis is hard and horny, and is composed of minute scales which are being continually worn away from the surface. The surface of the epidermis presents a multitude of minute openings when viewed with a magnifying glass. These are called the pores, and they are really the openings of the ducts of little glands situated in the lower part (the dermis) of the skin, and produce a watery fluid—perspiration or sweat.

The epidermis itself contains no bloodvessels and but few nerves—its office is simply to protect the deeper layer of the skin.

If we thrust a needle through the epidermis without penetrating the dermis beneath, we feel no pain and shed no blood; but so soon as the dermis or true skin is injured, we feel a sharp sensation of pain, and more or less blood flows. The epiderm of all wool-bearing sheep, especially the merino, is very thin, so that the blood underneath it shines through and imparts to the skin a peculiar pink appearance, which is regarded as a sign of good health.

The deeper portion of the epidermis, which connects the outer horny layer with the true skin, is softer and less transparent. It is made up of minute cells, some of which contain granules of pigment or colouring matter. The latter imparts to our domestic sheep those shades of colour which vary from light-grey to black. The pigment layer of the skin is also called the *rete mucosum* (mucous net) or the Malpighian layer. The cells of the *rete mucosum* are nourished by the blood which circulates in the dermis. They are also being continually pushed outward by the growth of the new cells beneath, and as they approach the surface the pigment disappears, and they become gradually more and more horny, being, in fact, converted into horny scales which take the place of those which are continuously worn off by friction from the outer layer.

The dermis or true skin (or *corium*) consists of fibres or connective and elastic tissues, interwoven with minute bloodvessels and nerve-fibres. Its surface is drawn up into finger-like projections called *papillæ*, the largest of



a. Corium.

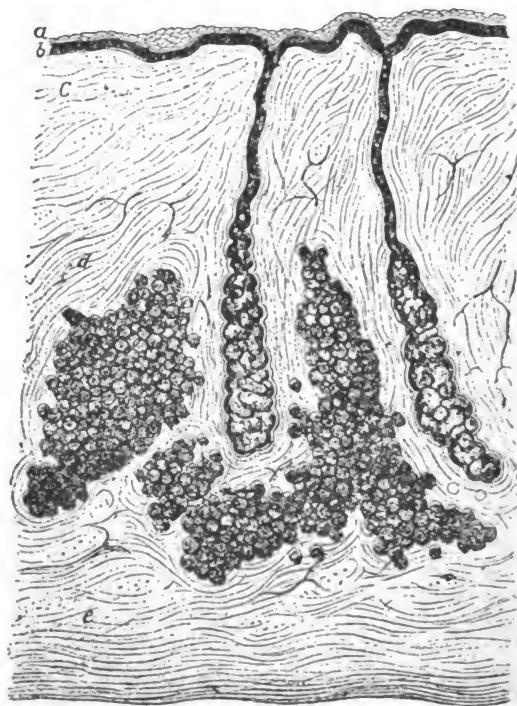
b—c. Papillæ.

which are about $\frac{1}{100}$ of an inch in length; the outer portion is extremely well supplied with bloodvessels. Every *papilla* has its loop of capillaries. The



deeper portion of the dermis is looser in texture, and contains an amount of fatty tissue. Beneath this again is a loose cellular tissue—the subcutaneous tissue which contains a larger proportion of fat. The use of this latter tissue is to fill up all the irregularities of surface in the underlying parts, and to give the rounded form and plumpness to the surface of the body.

The skin contains a number of glands which are situated in the lower part of the *corium*. Their construction is more easily understood if we imagine an indiarubber tube open at one end, closed on the other, and wound up loosely on



SUDORIPAROUS OR SWEAT GLANDS.

a. Cuticle.

b. Rete mucosum.

c. Cutis.

d—e. Elastic fibres.

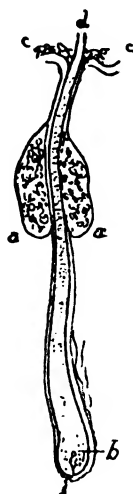
the other side into a ball. This ball would resemble the gland, and the straight part of the tube the "duct," which carries the fluid manufactured in the ball to the surface of the skin.

These glands are called the sudoriparous or sudoriferous glands (from the Latin *sudor* sweat, and *paro* I prepare; or from *fero* I carry). Out of the blood which is supplied to the gland by minute vessels, and through the action of the nerves, these glands separate or excrete water and certain substances, which are dissolved in it, and form the sweat. Generally we do not notice the sweat as it leaves the gland in the shape of vapour (insensible perspiration). Sometimes the sweat collects in the shape of little globules on the skin (sensible perspiration or sweat).

The skin also contains a multitude of glands that differ greatly from the sweat glands in structure. They are situated near the hairs. Their ducts enter the sheath of the hairs, before the latter has reached the surface of the skin. They produce a fatty material, which forms a greasy coat over the hairs. These fat glands are composed of a large number of closely packed lobes, each of which is supplied with its own duct, all of which join to form one tube, by means of which the fatty excreta is emptied into the sheath of the hair. As these two kinds of glands are of special interest to the woolgrower, they will be more thoroughly explained later on.

Hair, wool, horns, nails, &c., are horny growths of that part of the epiderm or cuticle which is called the horny layer.

The different parts of the skin are not of equal thickness. The skin is thickest on the back and sides, and thinner on the belly and genitals. The diameter of the skin—*i.e.*, its thickness—varies in the different races, and all experienced breeders agree that the appearance and the colour of the skin furnish us reliable symptoms of the general health and the fattening properties of animals. A fine skin should be thin and elastic; it should clothe the body loosely, it should have a healthy colour, and a certain aromatic smell peculiar to the race. The last two qualities refer especially to the merino. The healthy skin of those animals should be quite pink, and emit that peculiar odour characteristic to fine-wool sheep—a scent which cannot be described in words. The first author on sheep who has devoted some trouble to the study of the skin is, I believe, the Viscount Perault de Jotemps. He makes some very interesting comments upon the importance of the skin. He not only draws our attention to the fact that the finest descriptions of hair or down are produced by the uppermost layer of the *corium*, but also that the thinnest parts of any kind of skin generally produce the finest hair or wool, and he argues that we must try to breed very thin skin in order to obtain fine wool. Perault de Jotemps' theory found many followers at first, but the sheep-breeders of the present day cannot quite agree with him on all points. It may be perfectly true, owing to the nature of very thin skin, that it cannot produce anything but wool of a fine diameter; but it does not follow that fine hair or wool cannot be produced on anything but thin skin. Mr. A. P. Thacker, late manager of the Royal Agricultural Academy of Moeglin, pointed out that we must not expect large quantities of wool to be produced by a thin membranaceous skin, because such is not able to hold blood enough to supply the roots of the woolfibres with nourishment; in this I think he is quite right. He also proved that faulty wools are mostly found on the thinnest part of the skin, and therefore advocated the selection of thick-skinned animals for the purpose of obtaining the greatest possible density without faults in the wool. Owing to the great difficulty of obtaining a good supply of instructive material, it will be some time before the question of thick *versus* thin skin will be put to a scientific test. We must not forget, however, that thinness of skin is one of the chief characteristics of all the best English breeds of cattle, sheep, and



a. Fat glands.
b. Hair bulb.
c. Cuticle or epiderm.
d. Shaft of wool fibre.

horses—that the heavy fleeces of Leicesters, Cotswolds, and Lincolns grow on remarkably thin skins. I agree with the late Mr. Adolph Staiger, the celebrated sheep-breeder of Saxony, with whom I had a long discussion on that subject, that we do not require so much either a thin or a thick skin for producing the finest and, at the same time, heaviest fleeces, but a close-grained yet fine and highly organised skin, with an equal thickness, if possible, in every part. If we were to make systematic attempts to produce sheep with thick skin, we must naturally interfere with the development of the fœtus. The skin is formed at a very early period of the growth of the embryo, and it is not unreasonable to suppose that the healthy and vigorous extension of the body into length and breadth must, in a certain measure, be interfered with if surrounded by an unnaturally thick integument during the earliest periods of development. Sheep with unnaturally thick skins never grow big, nor do they fatten easily. It is evident that we have to pay very great attention to the development of desirable or undesirable qualities in the skin, and it will be highly interesting if we could get more reliable and more practical information on that subject. When we compare the different kinds of sheep, we find them generally without wool in the face and the legs, but covered with a short pointed hair, and the whole central line of the body—the navel, wither, rump—subject to faulty growth of wool. It appears that the best wool grows on those parts of the skin that cover thicker layers of muscle—namely, the neck, the shoulder, the ribs, the flanks. The other parts are singularly opposed to improvement. We wish that every part of the skin, every square inch of Nature's woolfield, should be made productive. If we consider how much valuable space of the woolfield is wasted by allowing so and so many square inches of skin to lie fallow—if I may be allowed to make use of that expression—we must naturally come to ask the question: Why do we not obtain better wool crops from the face, the legs, and the belly? It is either a matter of neglect on the part of the breeder, or it is owing to a certain law of nature as yet unknown to us. I am inclined to believe, yet I am not too confident about it, that imperfect development of the animal during its existence as fœtus has a great deal to say to it. Allow me to explain myself a little more fully. The right and the left side of the body are formed more or less independently from each other during the period of fœtus life. A comparatively short time before the birth of the animal both sides have closed up, forming thus a central line of junction, which in many cases remains rather backward in development. The open heads of new-born infants furnish good illustrations for it, likewise the hare-lip and the open palate at the roof of the mouth. Should this explanation be correct, we might guard, to a considerable degree, against any such imperfections through feeding the pregnant ewes well and by keeping them very quiet.

Some breeders believe that the fine texture of the skin is in keeping with the nature of all the fibres throughout the body. Cattle-breeders certainly agree to that, and it is a maxim pretty generally adopted that coarse skin, coarse wool, or coarse hair and coarse flesh, occur together. The quality of the hair or down on the extremities certainly serves us as a clue to the general organisation of the fibres throughout the body, especially of the wool. The more evenly and closely the face and the legs are covered with fine and regularly stapled wool, the more uniformity will, as a rule, be found in every part of the fleece. Of course this does not always hold good with reference to crossbred sheep. If there is no regular wool staple on the extremities, there should be at least a coat of fine, short, densely-grown and silky hairs.

The services which are rendered to the organism by means of the skin consist chiefly in regulating the exchange of temperature with the atmosphere. The skin also appears to relieve the kidneys by carrying off a good deal of moisture through the glands that produce the sweat, and by simple evaporation of moisture on its surface. It is also worthy of notice that the skin of some animals possesses a considerable power of absorbing gases and fluids. The numerous experiments of Magendie, Fourcault, Bouley, Gerlach, &c., have given us most interesting proofs of the exceeding importance of the skin as a

means of taking up oxygen and carrying off carbon-acid gas. A rabbit that was painted over with a coat of varnish died within a few hours with symptoms of suffocation. Horses that were shaved and painted over with tar died in seven to ten days. *Post-mortem* examinations proved chiefly that the blood was overcharged with carbon, and that the lungs had not been able to supply the body with a sufficient quantity of oxygen. These facts certainly might have no direct bearing on the question of woolgrowing, but they prove that the skin does not stand being much interfered with in the way of dipping, smearing, &c.

The Horse.

STABLE NOTES, No. 4.

By W. C. QUINNELL, M.R.C.V.S.

DISEASES OF HORSES.

CATARRH OR COMMON COLD.

Definition.—By the term “catarrh” we signify a condition characterised by inflammation of the mucous membrane lining the nasal chambers, and of its continuation along the upper portions of the respiratory organs. It is attended by a discharge from the nostrils, increased redness of the lining membrane of the nose, oozing of tears, and dropping of the head, occasional cough and sore throat, with or without perceptible febrile disturbance.

Causes.—Catarrh in adult horses is usually caused by some neglect or other in the management of the animal or of the stables. Sudden variation in the temperature, exposure to cold and damp, and contact with affected animals are among the chief causes of catarrh. Young animals, when first brought into warm stables, are especially subject to the malady. During the change of the coat there is also great predisposition to catch cold. It is most frequent, as we may expect, during cold, damp weather.

Symptoms.—The premonitory signs of this disorder are loss of appetite, dullness of the eyes, staring of the coat, a tendency to sweat upon the slightest exertion, sneezing, redness and dryness of the Schneiderian membrane (lining of the nostrils), followed by discharge at first thin but soon becoming turbid, yellowish-white, and profuse. Febrile symptoms are sometimes manifested, and, as is usual in inflammatory attacks, the internal temperature may rise about 3 degrees, or even higher. The pulse and respiration are then accelerated, and the bowels are usually constipated. Debility and general dullness frequently supervene.

Treatment.—In mild cases rest from work; remove to a well-ventilated but not draughty or cold, loose box, with an agreeable temperature of 60 to 65 degrees F.; clothe body and head, and bandage legs. Proper attention to diet and good nursing is imperative. In all cases the diet should be laxative, consisting of scalded oats, oatmeal or linseed gruel, and green food. Active purgative medicine in this, as in all diseases in which the respiratory organs are affected, is wholly inadmissible; but when the bowels are confined, an enema of warm water may be administered, and, if necessary, 2 drachms of aloes may be given, or a dose consisting of 2 oz. of Epsom salts, with $\frac{1}{4}$ -oz. of nitrate of potass given twice a day until the desired effect is produced. If there is depression, with staring coat, and the legs are of unequal temperature, stimulants, such as whisky and warm ale, should be given every three hours in small doses. In the early stages, when the mucous membrane is dry, inhalation of hot-water vapour, either alone or medicated with antiseptics or anodynes, is sometimes effectual. If the throat be sore, and the cough be

troublesome, hot fomentations and stimulating embrocations of compound liniment of camphor, or liniment of turpentine, should be applied to the throat, and saline electuaries given to relieve cough.

In all cases where the febrile manifestations are at all severe, febrifuges of 2 to 4 drachms of nitrate of potass may be given in the mash or drinking water; or a dose composed of 1 oz. of sweet spirits of nitre and 2 drachms of nitrate of potass in half-a-pint of water should be given once or twice a day for four or five days.

CHRONIC NASAL CATARRH.

Definition.—A discharge of varying character from the nasal chambers, which may be continuous or irregular.

Causes.—Most of the cases of nasal catarrh are due to an unhealthy condition of the mucous membrane of the nasal chambers, or of the mucous cavities in connection with them, and are the result of protracted and severe cases of acute catarrh. It may arise from other causes, such as external injuries, caries of the upper molars, disease of the jaw and face bones.

Symptoms.—There is a discharge of a glairy purulent fluid; and the Schneiderian membrane (the membrane lining the nostrils) is of a leaden hue, or it may be blanched and thickened with deposits. The general health of the animals is usually somewhat impaired, and their breath may be obnoxious.

Treatment.—Isolate patient. The animal should be rested, and liberal diet allowed. Internally: Tonics containing salts of iron or arsenic are recommended to improve the general condition. Locally: Lotions consisting of 4 or 5 grains of sulpho-carbolate of zinc, or $\frac{1}{4}$ -drachm of sulphate of copper to the 1 oz. of water may be injected up the nostrils. As it may be difficult to carry out the above in actual practice, inhalation or spray of sulphurous or carbolic acid should be tried. Iodoform, blown up the nostrils by means of an insufflator, is in some instances to be preferred to the application of lotions, besides being an efficacious remedy. As a general rule, animals recover if well treated. If chronic nasal catarrh can be traced to diseased bone or bones, an operation ought not to be delayed, and should only be undertaken by a duly-qualified veterinary surgeon.

HINTS FOR HORSE-OWNERS.

RUB a gall with stove blacking if you must work the horse and cannot give it time to heal. It seems to work wonders.

Do not feed corn to a driving horse. A little in the ration for the horses that are to do heavy work may do, but it must be fed carefully.

Add some wheat to the grain ration during winter, also a handful of oil-cake at each feeding. It will aid digestion, and make the coat glossy.

Don't feed hay in the middle of the day. Give the heaviest feed at night. Some horses require more hay than others. Study your horse, and never give him so much hay that he looks stuffed.

Horses have small stomachs; so should not be fed too much at a time.

If you allow your horse to gorge himself, he will have indigestion.

REMEDY FOR CUTS.

AN American paper gives the following as a remedy for horses which have received cuts and scratches through coming in contact with such things as barbed wire: By applying the ashes of burnt leather—old leather of any kind. The leather should first be soaked in kerosene oil, then placed in a kettle and ignited. The ashes are the cure. It is simple, and has not a big name, but it does the work.

FEEDING SUGAR TO HORSES.

A SOCIETY in France has been carrying on an interesting series of experiments connected with sugar-feeding to horses. At first 21 oz. of sugar per day were given per head; this rose to 52 oz. The fodder was hay and maize, respectively, and the maize-sugar diet proved of efficacy in establishing a high degree of alimentation. The results were so satisfactory that the Government has been asked to suspend molasses from all local and Customs imposts.

WORKING HORSES WITHOUT SHOES.
CUSTOMS IN DIFFERENT COUNTRIES.

LONG before the days of nailed-on iron shoes, some form of protection for the hoof against excessive wear was found to be necessary, and is still found necessary to-day in countries where the art of shoeing, as we understand it, is still unknown (says a writer in *Bibby's Quarterly*).

It is well authenticated that the horses of Alexander's army suffered severely during marches through Asia in consequence of the wearing of their feet, and that vast numbers, becoming lame, had to be abandoned. Mithridates, King of Pontus, while laying siege to Cyceies, sent his entire cavalry to Bithynia for treatment on account of the manner in which the horses' feet had suffered from marching. Xenophon recommended keeping horses on stone pavement to render their hoofs as hard as possible, and Calumella suggests oak for a flooring to harden the hoofs in similar fashion.

No Greek or Latin writer on military science, hippology, or agriculture mentions shoeing with nailed-on shoes; but for baggage horses, Xenophon recommends leather soles; Aristotle speaks of a kind of sock bound on the feet; the Greek veterinary surgeon, Absyrtus, clearly indicates the evils due to the straps by which soles were affixed; Cato suggests pitch to make the feet more resistant; and Calumella, Theomnestius, and Vegetius describe protecting soles or shoes formed of woven broom reeds and bast, fastened to the hoof by straps.

WHAT THEY DO IN JAPAN.

In Japan most of the horses, even the cart horses, wear straw shoes, made of rice-straw and bound on with ropes made of the same material. In Iceland ponies are shod with sheep's horns, and in the valley of the Upper Oxus the antlers of the mountain deer are used for the same purpose. In the Soudan horses are sometimes shod with socks made of camel's-skin.

In a state of nature the hoof acts as a protective covering to the sensitive structure of the foot, and so far as it goes the provision is perfect. In proportion as the bearing surface of the hoof wears away, it is renewed from above; but immediately the horse is made to draw or carry on ordinary roads the hoof wears more rapidly than it can be produced, and some artificial protection becomes indispensable. Not only is the general wear in excess of the growth, but perfect action in the animal rarely exists, and the horse does not lift and extend his feet and replace them quietly and evenly on the ground as in theory he is supposed to do.

NO HOOF CAN WITHSTAND A MACADAMISED ROAD.

Experience and close observation disclosed that in almost all cases there is such an amount of toe-digging, heel-battering, side-twisting, and forward-shoving that no hoof can withstand a hard macadamised road. At the same time, it must be remembered that regular shoeing, and improper treatment in the preparation of the foot for the reception of the shoe, robs the feet of the exercise of their natural functions, and diminishes their natural protection.

There is a vast difference between attempting to work a horse without shoes whose feet have always borne them, and whose frogs, soles, and walls have been ruthlessly cut and rasped, and attempting the same thing with a horse

bred on dry ground, whose feet have never been shod or mutilated. Similarly, we must not judge of the capacity of the feet to stand wear by seeing the havoc wrought with the hoof in a few hours when a shoe has been torn off or cast.

Farmers' horses, at seasons when they are not called upon to go on the roads, might with advantage work without shoes; and if their feet are not mutilated by the knife and rasp, but merely the edge of the crust rasped around when the shoes are taken off, most of them would stand it well, and their feet and legs be benefited by it.

Poultry.

POULTRY FOR A SMALL GARDEN.

A CORRESPONDENT asked: "Please give me instructions how to use a part of my back garden for keeping fowls for my own use. My garden is 60 feet by 50 feet."

As the question was rather a large order, we asked him to divide it, and we then referred the following questions to Mr. W. H. Martin:—

1. HOW MANY FOWLS DO YOU ADVISE?—From the questions asked, I presume the answers are for a beginner. I advise such to start with two or three pens, 12 feet square, made with hurdles as given in your February number. Make only two lengths—12 feet and 6 feet. By keeping to these two lengths a small pen can be put between two larger pens, and used for setting hens when chicks are wanted, and for growing green food when not so wanted. In one pen I would put 4 pullets laying in June, with a pure-bred rooster. In the other I would keep 6 pullets, and as the first lot go broody replace from this pen. I advise only 4 pullets to a rooster in order to get strong chicks when you set eggs. You will thus have 10 pullets and 1 rooster, and the pens will take up a space of 30 feet by 12 feet. By using 3 more 12-foot hurdles you could keep 6 more pullets.

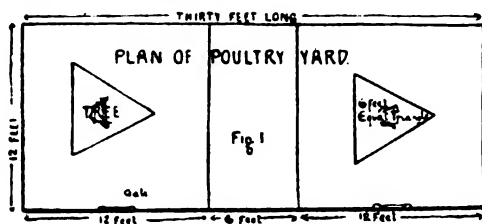


Fig. 1, "PLAN OF POULTRY PENS IN A GARDEN," is a plan of the way I would arrange my yards. Each yard would have a fruit tree, which would be protected by three small hurdles 6 feet long. In this little triangle under the tree I would grow rape, lettuces, rye-grass, mustard, or other green food for the fowls. Along the front I would have a gravel walk with plenty of sharp grit, which the fowls could reach by putting their heads through the bars. There is no door for the middle yard, as the 6-foot hurdle can be used for the purpose.

2. WHAT BREEDS WOULD YOU ADVISE?—It will be quite natural that I should advise the breeds I know most about. These are—Buff Orpingtons, Black Orpingtons, Plymouth Rocks, Langshans, or any first cross-breeds that will lay in June.

[We do not detract from Mr. Martin's recommendation, especially the last, but many poultry-breeders will regret that he has not included Minorcas and Leghorns.—Ed. Q.A.J.]

3. HOW MANY YARDS SHOULD I HAVE?—I would make as many as I could manage, but prefer 2 yards, 12 feet square, to one 24 feet by 12 feet. It is a little more expensive, but is much better. If you have fences you can use for side and one end, then you have fewer hurdles to make; but beware of tick in the fences.

4. WHAT KIND OF HOUSE WOULD YOU MAKE?—I think that some kind of movable house is very important. I am using several kinds made of iron, but all were expensive. Lately I designed one, which can be made any length, but 4 feet 6 inches long is enough for 6 fowls, and I find small flocks lay better than larger lots. Two houses 4 feet 6 inches by 2 feet 6 inches by about 3 feet high, would be a good start. It is a good plan to have a pen with green feed to put a fowl in directly she refuses her food, as a day without water and plenty of growing feed will very often bring her round.

5. SHOULD I BUY EGGS OR BIRDS?—Either, according to circumstances. But practise on chicks from your own fowls first. It is a great mistake for a beginner to buy either expensive eggs or expensive birds. It is not satisfactory to anyone.

[We particularly advise great caution in introducing birds lest tick be introduced at the same time. Examine the birds carefully, especially under the wings, and beware of the coops. The fowls may be clean, but the coops or boxes may have the pest hidden, for the bugs leave the birds by day and hide.—Ed. Q.A.J.]

6. WHEN WOULD YOU HATCH CHICKS?—I think that in this climate, if the ground is dry and care be taken, we may hatch all the time from May to November, or even in April, if we can get eggs from early moulted birds. From August to October are the best months for beginners.

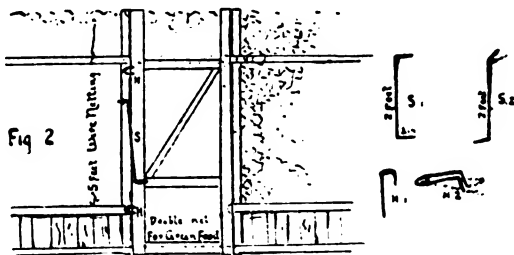


Fig. 2, "HOW TO MAKE THE DOOR OF A POULTRY PEN," shows the construction of the door of a hurdle, and explains itself. The wood is about 4 inches by $\frac{1}{2}$ inch thick. S.1. and S.2. show the method of making the spring. For a very strong spring, the wire should be bent as in S.1. and when being put on, one end is first fastened, and the other is then twisted around as shown. If the spring is not required to be so strong, the two ends are bent at right angles—i.e., bend one end and lay the wire flat on the table, then bend the other end so that it stands straight up from, or at right angles to, the table. These springs can be made either right or left handed. H.1. and H.2. represent the hinge. H.1. is an ordinary G.I. staple. H.2. is a piece of wire bent as shown. The drawing shows how they are put in.

7. (a) HOW SHOULD I FEED CHICKS?—This is the most interesting part of poultry-growing, and requires forethought and careful observation. I use ground wheat mixed with cooked meat run through sausage machine, or cut very fine, very young grass cut up with scissors, breadcrumbs, and hard boiled eggs; but eggs at 1d. each are too dear for a quantity of chicks, and can be omitted. Scraps from table, bits of boiled potato, gravy, &c., mixed with pollard or ground wheat, are good; but chickens' food should run out of your hand like sand, damp, but not soft and sticky. Stable manure with plenty of maggots is good, and by heaping it occasionally while there are live stock in it, gives them exercise as well as food. Incubator chicks put with hens to my mind is a backward step in poultry-growing. Feed chicks every 2 hours, or if they have a good grass run and a box for their food, every 3 hours would do. No artificial heat is required in South Australia, broods and brooder-makers notwithstanding. I have no difficulty when there are over 8 chicks, and I contend that chickens which require dragging up are not worth the trouble, and stock birds are sometimes the cause. Always set 2 hens at the same time to ensure a good brood for rearing without hen.

7. (b) TO FEED OLD FOWLS.—I think in winter three times per day for table fowls is not too much, and up to 9 months there is no fear of their getting too fat. I am classing fowls 6 months old full-grown; and pullets should be laying at that age, while the old style was to hatch this year and get eggs next, or in 12 months. In this age of hurry, good fowls should lay 100 eggs before being 13 months old. Where there is a large family, scraps should be saved, and not thrown anyhow in the "fowl" yard, but mixed with their morning soft food—stale bread soaked in hot water and (if only a small quantity wanted) the water squeezed out and bran and pollard in equal quantities added till it is a damp, crumbly food. Potatoes or turnips boiled and served in same way is another good change; boiled wheat is another good change. Meat or bones cooked and put through bone-cutter makes a splendid change, or a pluck cooked and run through sausage machine brings pullets on to lay early; ground maize and young barley, grass, or lucerne chaffed can be added.

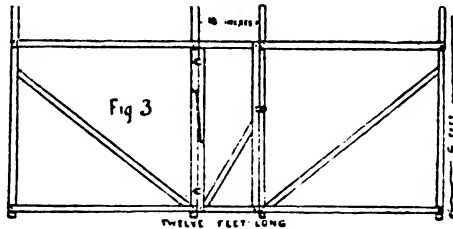


Fig. 3, "SIMPLE HURDLE," is a modification of Mr. Martin's hurdle as used by the editor for penning a few hens or chickens round fruit trees, or in the garden to destroy insects, &c. The frame is made as shown, and covered with 6 feet wire netting. The place for the door is cut out after the netting is stretched, and the piece answers to cover the door. If no door is needed, there is one upright in the middle, as in Fig. 4.

8. HOW CAN I GET EGGS ALL THE YEAR ROUND?—(By preserving them in water glass when plentiful.) Of course, the same hens will not lay all the year whatever the breed or treatment, so we have to arrange that some lay while others rest. This is done by (a) rearing pullets to lay when 6 or 7 months old; (b) hatching from birds laying in June or July; (c) keeping several varieties and crosses. Anyone who buys 5 or 6 hens and expects them to lay all the year round will be disappointed.

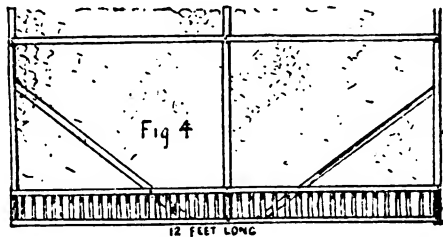


Fig. 4, "MARTIN'S HURDLE," represents Mr. Martin's method of making a hurdle. The lower portion, made of laths, answers the following purposes: (1) The poultry may put out their heads and pick grit from the path alongside. (2) They may have their food and water given in troughs on the outside. (3) They may feed green stuff growing alongside, the pen being moved forward as required. By slipping strips of tin or iron between the laths, which are nailed alternately on either side of the rails, shelter is made from the wind.

9. HOW LONG SHOULD I KEEP FOWLS BEFORE KILLING?—For roast fowls from 3½ to 9 months; all over that age should be boiled; two-year-old birds will take nearly 3 hours' slow boiling. If you credit your poultry with 1s. 6d. to 2s. for each bird killed, and all eggs at wholesale prices, they will pay for all food consumed through the year, and give a good margin. Most people keep their fowls too long, and they become liable to diseases, and this takes the profit.

10. SHOULD I KEEP MALE BIRDS OR BUY EGGS?—Certainly, keep male birds for getting strong chickens for home use, and pick the best and earliest cockerel for the pen of winter layers if you want early chicks. One or two extra pens are useful for keeping old birds while moulting.

HINTS ON HEALTH.—Make your houses convenient for clearing off droppings each morning, and cultivate the ground once or twice per week, especially after heavy rain; this I consider important, and will prevent unpleasant smells.

With a small number of fowls, and constantly changing their ground, and bringing sharp sand from road gutters or the river, and providing green food and clean houses, there should be no sickness or loss. My plan directly a bird refuses its food is to put it in a grass pen for a day or so, and if it has looseness of the bowels keep it without water, except once or twice per day. I have not used any of the many nostrums advised during the past year, and only lost one bird during the hot weather.

The shady side of the garden should be used in summer, and sunny side in autumn and winter; and in hot weather a "damp dust bath" should be provided by digging a part of pen the day after soaking in with water.

When I started I was told the tick would come in spite of all my care. I consider I have conquered, and I put it down to the free use of sulphur, and a 5 per cent. solution of crude carbolic acid applied with a spray pump, as a regular "Foul" yard with tick is not far away, and I consider the 4s. 6d. spent on a sulphur bellows money saved. My mode is to go around all the fences and houses wherever there is wood with the bellows, and blow sulphur in all parts—*Exchange.*

THE PLYMOUTH ROCK.

THOSE who wish to possess a really good all-round bird should give the Plymouth Rock a trial. The Plymouth Rock has been bred in England for a number of years, and has gained a well-merited reputation for most sterling qualities. The hens are excellent layers of dark-shelled eggs—the colour varying considerably—and are very steady sitters and capital mothers.

As table fowls they are good, though objected to by some people on account of their yellow legs—a prejudice that is absurd, considering the quantity and quality of their flesh. They thrive well on any soil and in confinement. They are fine birds in appearance, with shapely bodies and bright yellow legs and beaks, and single combs of medium size. The barred variety is blue, with bars of a deeper blue-black. Some of the chickens often come black, so that the purchaser of eggs for setting must not think he has been swindled if he does not get all blue chickens. There are also white and buff Plymouth Rocks, but neither is so popular as the barred variety.

Wheat is better for fowls than maize. It does not make them so fat, and, considering the number of eggs that can be secured by using it, is altogether a more economical food.

Tincture of iodine is said to be an infallible cure for warts on fowls. The tincture, which is very cheap, should be brushed over the warts with a feather every other day.

TURKEYS AS SITTERS.

WHEN "broody" hens are not to be procured, turkeys can always be trained to sit at any time. Take a turkey hen off the roost, and train her to sit. In a very few days she will remain quietly on the eggs. Turkeys are always ready to sit as soon as the eggs are ready for them.

FEATHER-EATING.

MANY of our poultry farmers are troubled with birds that have contracted the habit of feather plucking and eating. This habit may be caused in a number of different ways, but one of the principal causes will be found in the want of exercise of your birds. You will hardly ever see a bird that has unlimited freedom contract this habit, and, on the other hand, birds that are kept in small and close pens will nearly always learn this habit. When once learnt, it is a very difficult matter to stop them. One of the best cures I have found is to place straw in the bottom of the pen to the depth of 5 or 6 inches, and then scatter the grain on the straw, so that the fowls have to scratch and search for their food, thereby giving them plenty of exercise. Feather-plucking is also caused by feeding your birds on soft food, which is sticky and adheres to the feathers, and the other birds start pecking at this food, and take the feathers as well. In moulting time this habit is often observable. The young feathers are full of blood; and if a hen happens to get a taste of the blood from them, she will keep on, and often nearly strip the other bird. If the feather-eater is a valuable bird, you can stop her from it by paring the top of the beak, so that the soft portion of it projects over the outside and horny part. This will keep them all right for a time, but the beak soon grows, and the same process has to be repeated. Another very good and also safe plan is to get a piece of soft leather, about $\frac{1}{2}$ -inch square. Place this in the hen's mouth, and bring the ends over the top of the beak. Fasten the two ends together by a piece of light and strong cord or fine wire, which should be passed through the nostrils, and, when tied, will keep the leather in its place, and effectually prevent the hen from feather-plucking, and still allow her to eat her food without inconvenience. When birds are kept in confinement, it is imperative that they should always be provided with plenty of water, as the want of water, and also of green food, will often cause birds to contract this disagreeable habit of feather-eating.—*Scottish Farmer.*

CLASSIFICATION OF POULTRY.

By R. EDISON.

POULTRY may be defined into three classes, viz.:—

1. Poultry for table.
2. Poultry for egg production.
3. Poultry for exhibition.

Taking them in the above order, a few hints on what are the best poultry for table use may be acceptable to readers of the *Journal*.

An Indian Game rooster crossed with a Dorking hen is as near as possible an ideal table bird. The breast is immense, and the meat of splendid flavour.

A Pile Game crossed with the Dorking is also recommended, and the English Game—Langshan is known to be a splendid cross. Of course it is necessary to select good healthy specimens of the various breeds, and remember you are breeding for the table, and not for the show.

Now a few words on the best poultry for egg production. From my own experience, and from frequent trials made by those who have to rely on eggs for a portion of their livelihood, it may safely be stated that the best layers are—

1. Minorcas.
2. White Leghorns.
3. Brown Leghorns.
4. Andalusians.

The Leghorns or Andalusians would lay a few more eggs in the year, but the extra weight of the Minorca eggs justify me in placing them first in the list. For table and eggs combined, I should select the Orpington for those who wish to keep only one variety.

Plate CXXVIII.

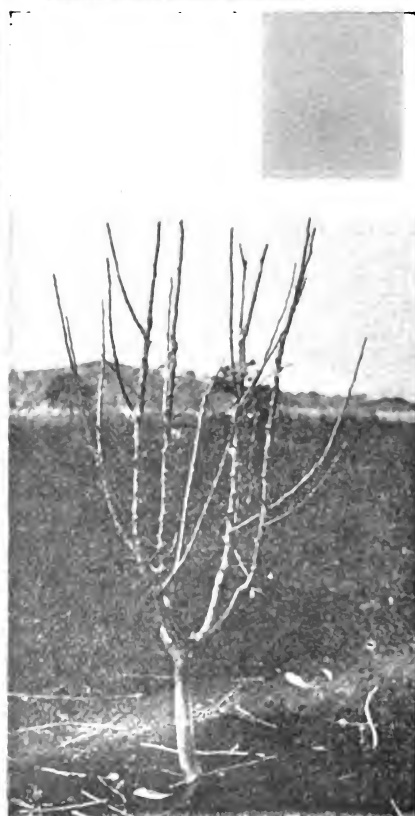
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1st Plate.
FRUIT-TREE PRUNING.

Many well-known breeders carefully mark their best laying hens, and breed from them only, and there is not the slightest doubt that this is well worth the trouble, and in a few years a grand laying strain would be produced. Remember, a great deal depends on how you house and feed your chicks. The best all-round food is wheat, and *no rubbish*—good wheat. Green food of some sort is also indispensable; and bonedust, grit, broken-up oyster-shells, and, better than all, “green bone” help materially to increase the egg yield. Maize should only be given occasionally—being too fattening for the hens you rely on for eggs. Fresh water, kept in a cool place, must be handy, and never put where the sun can warm it.

Fowls also require a dust-bath; they will keep themselves clean if you will help them, but, if they have nothing, insect pests will soon infest them, and gradually your birds will drop away. It is well worth your while occasionally to get a little cotton-waste, soak it well in kerosene, and rub it well in under the feathers, particularly about the neck and back of the head. Do a few at a time, but do them thoroughly. Clean out their houses regularly, and use lime with about a wineglassful of carbolic acid into a bucket of whitewash. Thoroughly wash the interior of the poultry-house with this, and also sprinkle it about the floor. Then cover with dry earth and ashes. You will thus have a poultry-house that you can enter with pleasure, and that your birds can roost in with comfort. Their perches should not be more than 2 feet from the ground, and should also be kept clean by occasionally washing with kerosene.

This seems a lot of trouble, no doubt, but you will find yourself amply repaid for it by having a healthy stock of poultry, which means profit instead of loss.

In my next article I will deal with show or exhibition birds.

The Orchard.

FRUIT-TREE PRUNING AT WESTBROOK EXPERIMENT FARM.

By ALBERT H. BENSON.

In the January number of the *Queensland Agricultural Journal* for 1898, Part 1, Vol. II., I gave an illustrated description of the principles of fruit-tree pruning, especially as regards the training of the young tree for the first three seasons; and the photographs, which are reproduced herewith, show how this method of pruning has been carried out by me in actual practice at the Westbrook and Hermitage Experiment Orchards, which were planted in 1897.

The illustrations on Plate I. are as follow:—

1. A “Gravenstein” apple-tree planted in 1898. This tree, when set out, consisted of one straight stem, which was cut back to a height of 20 inches, and the four branches shown in the illustration were allowed to develop, all others being removed by summer pruning. It will be noted that each of the four branches has a firm hold of the main stem, and that there is, therefore, no likelihood of splitting.

2. Shows the same tree, pruned.

3. A “Monroe’s Favourite” apple-tree planted in 1897. This tree was treated in a similar manner to No. 2 last year, the height to which it was cut back being easily seen in the illustration. The tree made a vigorous growth, and was summer-pruned in December last, a small amount of disbudding having taken place previously. The effect of the summer pruning is shown by the development of fruit spurs, which is taking place along the main branches, and by the formation of the tertiary forks.

4. The same tree, pruned. It will be noted that no fruit spurs have been removed, but that the tree has been thinned out by the entire removal of superfluous branches, and has been cut back to outside buds, so as to spread the head of the tree during the coming season. The tree as pruned is well protected from sunburn, and will come into fruit early.

The illustrations on Plate II. are descriptive of—

5. A "Bartlett" pear-tree, "William's Bon Chrétien," planted in 1897. This tree was treated in a similar manner to No. 2 in 1898, the extent to which it was then cut back being clearly shown in the illustration. It was summer, pruned last December, this latter pruning developing the fruit spurs on the older wood, and forming the tertiary branches. It will be noted that the tree is well balanced, and that the formation of narrow forks has been prevented, each branch having a firm hold of the main or primary branches.

6. The same tree, pruned. Being an upright grower, it is cut back to outside buds. No fruit spurs are removed, but superfluous branches have been cut right away.

7. A "Lady Palmerston" peach-tree, planted in 1897. This tree was cut hard back last winter, and the only treatment it received last summer was a little disbudding early in spring, and the shortening-in of straggling growths about Christmas time.

8. The same tree, pruned. It will be noted that a large quantity of wood has been cut away, and that the laterals have been carefully thinned and shortened in. This severe pruning is necessary in the case of the peach in order to produce large fruit, for if the trees are insufficiently thinned out they will produce a large number of small-sized fruits which are valueless for canning or drying. The tree, as pruned, will only carry a few fruit this coming season, but will produce strong fruiting wood for next year's crop. The pruning of the Persian varieties of peaches requires considerable judgment in this colony, owing to the fact that many varieties only produce their fruit buds on the extremities of the branches. Hence, if all laterals were cut back hard you would have no fruit at all. With such varieties, a systematic thinning out of superfluous branches without cutting back gives the best results. Chinese varieties of peaches, however, require to be both thinned out and cut back, as they are prone to overbear and produce small, unsaleable fruit.

Viticulture.

A DESCRIPTION OF SOME VINES GROWN AT THE STATE FARMS.

By E. H. RAINFORD, Viticultural Expert.

No. 4.—THE MOURISCO PRETO.

VIGOROUS grower.

Leaf.—Large, almost round, five-lobed, not deeply indented; petiolar sinus open; colour bright-green, slight down below; teeth broad, shallow, and blunt.

Bunch.—Large, pyramidal, branched, and rather loose; stalk long, not very thick.

Berry.—Large, round, and somewhat flattened at the end; reddish black in colour on long stalklets; juice sweet and agreeable.

5



6



7



8



2nd Plate.
FRUIT-TREE PRUNING.

No. 5.—THE TINTA CÃO.

Vigorous grower.

Leaf.—Large, smooth, trilobed, not deeply indented; colour bright-green, occasionally with reddish spots, slight down below; teeth irregular and sharp.

Bunch.—Medium size, irregular in shape, and loose.

Berry.—Medium size, round, blue-black in colour, skin tough; juice sweet and astringent.

REMARKS.

The above are two of several varieties of Portuguese grapes used for the production of port wines, which have been collected by the Department, and will prove a valuable addition to the grapes of this colony if they take kindly to the soil and climate. They have been grown, amongst others, in California very successfully. In a report to the College of Agriculture upon viticultural work, it is stated regarding the Mourisco Preto:—"It is one of the most promising port varieties so far tested in California. It bears well, and produces a good port . . . it attains a good amount of sugar, and is marked by low acid and low tannin. It is quite unsuited for dry wines, but the composition of the must and the general character of the grape render it eminently fitted for port." Regarding the Tinta Cão, the same report says:—"It is a very healthy, strong-growing vine, and gives an excellent blending port."

As no single variety of Portuguese grapes will give all the requisite characteristics of port wine, it is usual to plant several varieties to give a satisfactory blend. Vignerons must bear this in mind when planting, and also remember, to avoid disappointment, that, although Portuguese grapes may be planted in Queensland, they will not produce a wine equal to the fine productions of Portugal.

Many applications have already been made to this Department for cuttings of the vines which are described in the *Journal*. As a limited number of cuttings of each variety were collected, some of which perished during their long journeys, it will take quite two years to sufficiently propagate them for distribution.

Applications received will be registered, and dealt with in order of priority.

SOME CONSIDERATIONS ON THE WINES EXHIBITED AT THE
BRISBANE EXHIBITION FOR 1899.

By E. H. RAINFORD,
Viticultural Expert.

As one or two of the exhibitors of wines at the recent Exhibition have indicated a wish to know the points which decided the judge's decision in favour of any particular wine in its class, and also to hear his criticisms on the wines in general, the writer, who had the honour to be entrusted this year with the task of judging the wines, takes this opportunity of acceding to their views in the shape of a short article in the *Agricultural Journal*.

The wines exhibited were divided into eight classes—Light, medium, and heavy reds; light, medium, and heavy whites; sweet reds and sweet whites. No mention was made in the classification as to whether the first six classes were to be dry or not, but, as the last two classes specially mention sweet red and sweet white, the judge took it for granted that the others should be dry, and by that it is understood that only a very faint sweetness at most would be tolerated. One very meritorious wine was thus thrown out in the heavy red class, as it was too sweet for the "drys," and not sweet enough for the "sweet reds." Unless, therefore, a fresh classification is made, exhibitors should in the future avoid sending in wines which are betwixt and between.

Coming now to the wines themselves and some friendly criticisms. The light whites had a tendency to too much colour, in some cases so much so as to resemble wines of the medium class. Chablis should be made as light in colour as possible, and this can be attained by vintaging the grapes before full ripeness,

by running the fruit through the crusher and pressing as quickly as possible, being careful to avoid fermenting and storing in casks that have contained dark-coloured wines. Some of the wines exhibited were not quite bright, and some were smelling strongly of sulphur. This defect arises either from over-sulphuring, or, what is more probable, the use of preservatives, which, by chemical combination in the wine, slowly evolve sulphurous acid. Whatever the cause, the effect is to kill the natural bouquet. The writer judged the wines from a commercial point of view, and he considered a wine that was thick or reeking of sulphur was not fit to put on the market, and would give the preference to a wine without those defects, even if slightly inferior in general quality. One very good light white wine, made from white Hermitage grapes, was not quite clear, and was foxy in colour; the bouquet and flavour were, however, very good; and if the maker will correct the defects mentioned, he will have a very good wine.

In the light red class, the general defect was a coarseness and astringency, either due to crude manufacture or to the use of Espar grapes. This grape, unless vintaged at a state of full maturity, gives a harshness to the wine very difficult to get rid of; it should only be used with Pineau or Hermitage in certain proportions. One or two of the wines were not quite clear, but the bouquet was good, especially in the prize-winner, if the writer remembers rightly. In making this quality of wine and the medium reds, prolonged vatting must be avoided, or, if the grapes used give a very dark wine, a judicious admixture of white grapes of not too high a density is advisable.

In the medium whites, there was a tendency to over-sulphuring, but the colour and brightness were all commendable; the prize-winner was a very agreeable wine. These were the best wines shown.

In the medium reds, the same defect noticeable in the light reds—*i.e.*, harshness and astringency, and some cloud, due to oxygenisation of the colouring matter—was apparent. A light fining would do some of these wines good, also blending with softer growths. The bouquet was generally good, and the wines sound; the raw article was there for making first-rate wines, but more attention in the making is required. Probably all the wines exhibited were quite bright when bottled. Why, then, was so large a percentage cloudy and even thick on testing them? Simply because the colouring matter is in a state of instability, the acidity of the must is insufficient to fix the colour, and, on the wine being oxygenised by exposure to the air, it is deposited out in an insoluble form. The remedy is either to make the wines lighter coloured by shorter vatting or to increase the acidity of the must by the addition of tartaric acid.

The heavy whites wanted, one and all, character. The colour, brilliancy, and soundness left nothing to be desired; but there it ended. The prize-winner, by its after-taste, was evidently a wine of some age, but the bouquet was strangely behindhand—it should have been much better. Most of these wines approached perilously near the line dividing them from sweet wines. They should be made drier to have more character.

The heavy reds were good all round, with good bouquet and colour, but too coarse. The prize-winner was a good sound wine, seven years old, of fine bouquet, but rather coarse. Another wine of even better quality was thrown out because it was quite thick and unfit to be put on the market. One very good wine, apparently made from Hermitage grapes, was too sweet for this class.

The first sweet white that the writer tasted was so syrupy that all the others appeared quite dry after it, and he had to munch a bag of plain biscuits to get rid of the taste. The idea that the sweeter the wine the better it is, is a common mistake. Were it so, then a bag of sugar would help to take all the prizes in the country. It may be taken as a fundamental principle that the sugar and alcohol in this class of wine must march together. It is the strength of sweet wines which prevents them from cloying and nauseating. A wine-maker who sells a syrupy wine of low alcoholicity is dispensing an emetic. The other exhibits were much better in this respect, the alcoholicity and sweetness being properly balanced, but the bouquet of them all left much to be desired,

Plate CXXX.



WALLFLOWER POISON-BUSH (*Gastrolobium grandiflorum*).

and this is attributable in a great measure to the use of cane-sugar. An addition of brown muscats to the vintage would improve the quality of this class of wine.

The sweet reds were also a good class, the prize-taker being a very fine wine, apparently of a good age, and fully matured.

A little more maturing would have improved some of the others.

A very good wine for its age was shown from Bundamba. In a couple of years, when it has lost its sweetness and newness, it should turn out excellent. If Bundamba can produce wine like that, there is a field for an enterprising vigneron. The white, however, from the same place was badly prepared, and out of condition.

The writer has touched upon the defects apparent in the different classes, and has now much pleasure in adding that many of the wines were very good, and others showed that with attention to manufacture and subsequent handling they could be much improved. On the whole, the outlook is encouraging for meeting possible southern competition. The writer judged the wines by points on clearness, colour, bouquet, soundness, taste, and after-taste—the last because, although a wine may be pleasant on first entering the palate, it may leave an after-flavour less agreeable. On all these points vignerons should be careful to examine their wines; and where found faulty in one or more respects, they should study how to remove the defect and improve the wines.

Botany.

PLANTS REPUTED POISONOUS TO STOCK.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

WALLFLOWER POISON-BUSH (*GASTROLOBIUM GRANDIFLORUM*, F.v.M.)

THIS is a dwarf or sometimes a tallish shrub of a light-grey colour, from being more or less clothed with short soft hairs. The leaves are usually opposite, oblong, and more or less notched at the end, from 1 to 3 inches long; the short ones are frequently heart-shaped; all are of a stiff, harsh character. The flowers are borne on short racemes in the upper axils of the branches, and are rather large and showy, of somewhat chocolate colour, bearing some resemblance to the garden wallflower. The pods are silky-hairy, and hang on slender stalks from the persistent calyx.

The genus is almost limited to Western Australia, where the thirty or more species are known as poisonous to stock. *G. grandiflorum* is the only one met with in Queensland; and so virulent is its poison at certain stages of its growth (particularly when in flower), that working horses and bullocks have to be yarded at night when passing through belts of the plant.

It seems only to be dangerous in a living state; for the late T. K. Staiger and others have failed to discover any active poison from an analysis of dried portions of the shrub.

Some writers have recommended frequent burning off of the plant as a means of its eradication; but were this plan adopted, the aftergrowth, which would naturally spring up from the root-stocks, would make the localities more dangerous to stock than before.

Horticulture.

YUCCAS AND AGAVES.

By R. R. HARDING,
Curator, Toowoomba Botanic Gardens.

How much would these be thought of, if they were stove plants, difficult to cultivate and to get into bloom. But as they are only hardy plants that will grow anywhere, they are seldom seen cultivated, and yet more beautiful or more striking objects it is impossible to have, especially when in full bloom. Effective as they are in the form of a single specimen upon the lawn, they are much more so when in groups, or planted on an embankment, especially if their foliage is well mixed. They also make a splendid background for more dwarf-like plants. No matter how severe the drought, they do not feel its effects; in fact, during the past dry season, when all other flowering plants suffered, these with their blooms enlivened up the grounds. Those who have never grown yuccas, nor have ever seen them in masses, can have no idea of the grand display they make when mixed judiciously. Ground totally unfit for anything else, is well adapted for their growth. I have often advised some residents out West, where the rainfall is small, and who have been disheartened at losing their plants year after year, to go in for these and all other plants that delight in such weather. Of course, they will not make much display of flowers, but, if placed properly, their foliage is quite equal to the former in beauty, and would certainly be better than nothing. When once established, they may safely be allowed to care for themselves: no undergrowth will affect them, and no garden is complete without them. Quite a number of these bear beautiful flower-stems 3 feet or more in length, each single flower nearly pure white, followed by ornamental fruits in their season, like short, stout bananas. These glisten with the rich colour of polished cedar. I have used this plant with good effect in hiding unsightly corners and buildings, at the corners of flower-beds to prevent visitors from taking too short a cut, at the corners of fences; and when planted in double rows as an ornamental dividing fence, or in unsightly tracks through the lawns, their sharp dagger points answer these purposes with good effect. They are the best plants for the Downs for putting into vases, and if the sharp points are cut off they do no harm. Around the bandstand in these grounds, the flooring being some 6 feet from the ground, I formed an embankment sloping down to nothing. Yucca was employed in two rows all round, except at the entrance. These were merely the tops from other older plants cut to any length required, and stuck in the earth—nothing more. On the outside the bank was finished off with cuttings of *Echeveria glauca*. At each side of the entrance two yuccas were planted in vases. Now this is one of the prettiest groups in the grounds. The plants grew straight away, and each year they all bloom together, and have given no trouble. They are very useful in preventing boys from climbing up the railings when the band does play. Could not these be utilised along the banks of the river in the Botanic Gardens, or at the forts at Lytton, as a means of partial defence? They would be suitable for binding the soil together and for stopping the drift of sand.

In some parts of the globe they are commonly called Dagger Leaf, Striped Dagger Leaf, Adam's Needle, and Eve's Thread. The blooms of these are edible. They are picked from the stems, and scalded two or three times in boiling water to draw out the rather peculiar taste. Then, cooked with bacon, like cabbage, and eaten with vinegar, they are considered quite a treat. The leaves

torn in strips can be used for tying up other plants. The Mexicans burn a leaf to ashes, put the ashes in a bottle, pour on water, and use the liquid as a remedy in flux and its kindred diseases. They say it is a certain cure.

They are described by the Mexicans as amongst the most useful of plants. In Mexico, the fruit is eaten in both the fresh and dry state. The plants grow from 2 to 20 feet high, in some places becoming tall trees, the trunk varying in diameter from 8 to 20 inches. They abound in fibre, and the stems are charged with a saponaceous principle which the Indians make use of in the place of soap by simply cutting slices off the stem, beating these into pulp, and mixing this with water. The fibres obtained from some are of great length, very strong and durable, and seem to be well adapted for the various manufactures of the Indians of Southern California, who make with them excellent horse blankets, while all the tribes living in the country where the plant is found use it to make ropes, nets, shoes, and mattresses. The seeds, which contain a quantity of nutritive matter, are ground into flour, and eaten either raw or cooked in the form of mush. The young and tender white flower-spikes are eaten raw or roasted, and are also used after the manner of asparagus. The root is pounded up and used as soap. One *Yucca*, which is a common garden plant, contains a very soft fibre which is used for padding horse blankets.

In far-away Mexico, there are great tracts of desolate desert lands where the very hills seem destitute of life and beauty; where the earth is shrivelled by centuries of terrible heat; and in this desert tract grows a curious, misshapen, grotesque, and twisted plant that seems more like a goblin tree than a real one. Of all the trees in the world, you would imagine this to be the most outcast and worthless—so meagre a living does it obtain from the waste of sand and gravel in which it grows; and yet this tree is now being sought after and utilised in one of the world's greater industries—an industry that meets the daily needs of civilisation, and is of special importance to all of us. This is the much-despised *Yucca*, which for a long time was considered worthless. But not long ago it was discovered that the fibre of this plant could be made into an excellent paper, and now one of the great English dailies—the *London Telegraph*—is printed upon paper made from the *Yucca*. Indeed, the proprietors of the *Telegraph* have purchased a large extent of ground in Arizona, merely for the purpose of cultivating this plant, and manufacturing paper from it; hence it has obtained the name of the *Telegraph plant*.

Further values of this plant are still being found out. An American periodical has an advertisement announcing *Yucca* as a remedy for premature baldness.

When these plants get to a great height, I have them cut down close to the ground. The tops are put in again; some of the largest stems are put away to dry; then these are cut into sections on which to grow orchids, as they are very light and fibrous. For this purpose I know of nothing better. Each foot, when dry, weighs 1 lb. Others are placed under the soil, and this gives me a quantity of young plants. Could not this idea be carried out by orchardists? Bury a number of stems in the grass, when the small dagger points would be a surprise to trespassers.

I have now, I believe, given the whole of my little stock of knowledge; and will close with one more remark. That is: *Yuccas* are a fine genus of plants, very ornamental on banks or outside rockeries or dry places, some of them producing magnificent tall spikes of innocent white flowers. They will grow anywhere in a warm climate, even in pots or vases.

Aloifolia variegata is a superbly variegated variety, growing quickly and producing a most symmetrical plant. Its green leaves are striped with yellow. It grows to a height of from 8 to 12 feet. The next four best are—*Filamentosa*, *Floriosa*, *Quadricolor*, and *Recurvata*.

In 1875 I extracted fibres from the *Yucca* by hand, which were exhibited in the adjoining colonies, also, I believe, at the Paris Exhibition, by Walter Hill, Esq., then Director of the Botanic Gardens, Brisbane.

Apiculture.

BEES AND FRUIT.

THE question as to whether bees injure fruit is a very old one, and has often cropped up, and has often been settled in favour of the bee. Any entomologist knows that the antennæ of the bee are incapable of cutting into the skin of sound fruit, and in order to make a start he must first find a hole already made by some other insect, such as the ant. Yet it is quite true he will bite through the wooden division boards of a hive.

This point was once raised at a meeting of the beekeepers' association, and an explanation demanded. An expert present answered by asking the question: "Why is it that, although a man can bite through a piece of plaster, he cannot make a hole with his teeth through a plaster wall?" Yet you say you have seen bees which looked as though they were searching for a weak spot on sound fruit upon which to make an attack, although you very cautiously add that you did not see them actually succeed in piercing the fruit. Bees, although possessed of instinct in the largest degree, are very stupid in many things; and one may often see them trying for hours to do something, which, if they had any reason, they would have known to be a physical impossibility.

But there is no need to confine ourselves to theory only. The practical test has often been made of placing absolutely sound fruit in the vicinity of bees, care having been first taken to examine the fruit microscopically, to see that it was uninjured. In every case, although the bees have hovered around, they have ultimately abandoned it untouched.—*Martin's Home and Farm.*

H. W. BRICE says that the fruit crop on a farm near one of his apiaries is worth £100 a year more than it was without the bees.—*Gleanings.*

VARIETIES OF HONEY.

ONE would scarcely suppose that there was so much difference in honey, and that there are a great number of varieties (says an American authority on bees); and his remarks should be of interest to our own beekeepers. Although conditions may not be the same, they are similar in some respects. There are almost as many varieties as there are different flowers that produce honey, and the difference in flavour is very perceptible. Since the introduction of the extractor, it is possible to keep each variety separate to quite an extent, and hence the opportunity it affords to see and taste the honey from the different flowers.

These varieties of honey also differ materially in colour. There are scarcely any two varieties of the same shade, and there are all shades from white or light down to dark or nearly black.

Buckwheat (which always got more credit than it ever deserved) produces the darkest grade of honey, or at least as dark as the darkest, and which would in any established market bring the lowest price. The only value of a crop of buckwheat honey is that it usually comes when other flowers are not producing nectar, being later in the season, and it keeps the queens busy laying and brood-rearing thus continually, which is very beneficial.

Various other plants and trees furnish a second grade—amber-coloured honey—a very beautiful golden colour, and which by a great many persons is preferred to any other. This honey is produced by nearly all fruit-producing trees and shrubs, and many wild flowers also. In the south-eastern States of America the poplar, or white wood, is the leader in this respect; and the famed white sage of the West is the same in that locality, especially California.

PREPARING HONEY FOR MARKET.

THIS subject cannot be written about too much. In these times of closest competition, it behoves everyone to put up honey in as neat and attractive a manner as possible. When it comes to receptacles for extracted honey or cases for comb honey, only the very best must be used. It will not pay to try to save a few shillings in this, and run the risk of losing pounds when your honey reaches the market. The trade in various localities often varies in its requirements as to style and size of package. Hence, it will be wise to first learn just what is demanded, and then comply therewith as near as possible. Endeavour to find out what the public want, and see that they are accommodated. Some people are whimsical; and yet if they are willing to pay for being so, no one need object.

Another thing—and it has been spoken of so often—whatever you do, be sure to clean every section of honey of every particle of bee-glue, scraping them thoroughly, if necessary, in order to attain the object. Some agents object to the producer's name being on each case or section, but we think none will care if only the name appears. We believe it would be a good idea for every beekeeper to put his name upon every section of honey that leaves his apiary. This can be done easily and rapidly with a rubber stamp. Then the consumer can call for more of Mr. So-and-so's honey, and a demand will thus be created.

Other ideas will no doubt suggest themselves to every wideawake producer of honey who reads this. As in most other things, it will pay well to use brains in the preparation of honey for the market. Nothing but an absolutely first-class article should ever be placed upon the market for this purpose.—*Martin's Home and Farm.*

FIXING FOUNDATION INTO FRAMES.

THE size of the brood chamber must be regulated to the size of the colony; in other words, there would not be more frames left in the hive than would keep the bees tolerably compact, and therefore in a better condition to winter well.

In the spring-time all young queens will be coming into full vigour with their work of ovipositing; and with eggs, brood, newly-gathered honey, and pollen in the cells, there will soon be insufficient room for the number of eggs the queen will deposit daily.

There is not a better method of recombining than by lessening the size of the brood chamber in the autumn, and discarding old and badly-shaped combs, and then adding at the side, in the spring, new frames with full sheets of foundation, till the hive is again full of combs. In the following autumn the old combs, or part of them, will be removed, and thus in three years all the combs will be renewed. The practice of renewing combs tends more than is often supposed to the quick increase of the stock and its general success. There are numerous instances in which the hives have not been recombined since the bees were first put in, years ago, and those stocks are among the moderate or bad ones of which complaint is made.

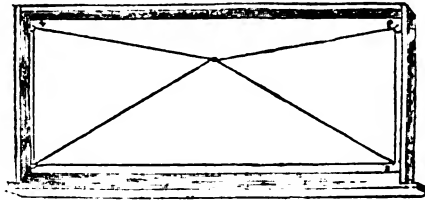
At the present time, no person who desires quick and regular increase will neglect to use foundation, and never starters or little pieces for the sake of economy (?) in the place of full sheets.

To find out how eagerly the bees accept sweet new foundation, place a fitted frame in the middle of the brood nest of a strong stock, when brood-spreading will not endanger the brood, and within twenty-four hours it will be almost a comb, and contain hundreds of eggs. The same eagerness to get on with work is not manifested if, instead of foundation, combs saved from the previous or other years are given. It is also much better to weed out the old combs, and thus get rid of those that have in them too many drone cells, or that are overburdened with pollen.

The first sheets of wax—used more as guides than helps to the bees in the building of their combs—were fixed to the centre of the top bar of the frame by the aid of melted wax. The next step was to cut the top bar nearly into two parts with a circular saw, and, while holding open the saw-cut with a small screwdriver, place in the top of the sheet of foundation. On the withdrawal of the screwdriver, the sides of the frame closed and held the wax sheet firmly. This plan is used very extensively at the present time, but wiring to maintain the sheet in the centre of the frame, even if the hive did not stand properly level, was soon the approved method of fixing foundation in brood frames.

A simple plan is here illustrated. Five wire nails are driven through the side bars very near to the top and bottom, and the points are turned to form hooks. Then No. 30 tinned wire is passed round from hook to hook in the following order:—1 to 2, and thence by 3 and 4 to 1; from 1 it is passed below the strand running from 3 to 4, and when drawn tight finished off at 2.

The wires are then exactly in the centre of the frame, and the next step is to imbed them in the foundation. To do this, lay the sheet of foundation upon a board to just fit inside the frame, and fix crosspieces of wood beneath it, so that the wires just rest upon it. Then run along the wires a special wheel, which will press them down into the foundation. The work is done most satisfactorily if the wheel is heated in hot water or over the flame of a candle or lamp.

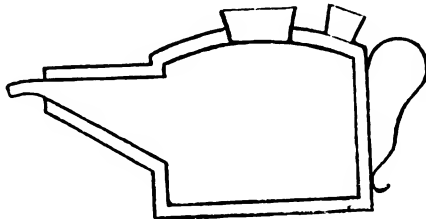


WIRED FRAME.

Unless the top of the sheet is fixed in a saw-cut, it may sag, so most beekeepers use the wax smelter, and unite the wax to the top bar by running along a little melted wax. The smelter is also used when the starters or full sheets are not fixed in a split top bar of the sections.

ENTICING BEES INTO SUPERS.

Surplus chambers will soon be required. The early seed crops come into flower early in May, when they will be one mass of bloom. Lucky the beekeeper who has his stocks strong then, and his supers all ready! No device for enticing bees into supers is required under such conditions. There are, however, conditions that militate against bees entering supers, and these had better be removed. In the first place, supposing we have hives holding fifteen or more frames, we cannot expect them to be full to overflowing with bees, although at the same time ten and eleven framed stocks are boiling over with bees. The method of procedure in such cases is to lessen



the size of the brood chamber by removing the outside combs, and placing close to the combs left dummies to keep the bees to the frames allowed them. If supers are then put on these hives, the bees will enter them just as readily

as they will those over the hives that cannot hold more than ten or eleven frames. Next to securing a crowded brood nest, we must have warmth maintained in the super as it arises from below. Over the super place quilts and chaff cushions; in fact, too much woollen covering cannot well be given to the supers first given, because they are put upon the hives just when we are liable to have changes of temperature and cold nights.

As an inducement to the bees to enter the supers, place in the sectional super any partly-combed sections left from the previous year, and in the frame super use combs that are kept solely for extracting purposes. Here we find a contrast; for while bees take to foundation in the brood chamber most readily in preference to combs, in the super they enter and commence work upon combs rather than upon foundation. The reason for this is, no doubt, the fact that the very high temperature that is needed for the proper working of foundation into comb cannot be obtained and maintained early in the season, while the temperature is alternating between hot and cold, and while cool, if not cold, nights predominate.

BEEKEEPING IN QUEENSLAND.

By F. W. SMITH,
Lemon Grove Apiary.

BEEKEEPING is one of the most interesting industries which engages the attention of man.

In America, beekeeping is being carried on very extensively, both for pleasure and for profit.

It is due to the researches made by the late Rev. L. L. Langstroth, of Philadelphia, U.S.A., that beekeeping has been brought to its present state of efficiency, and the beehive used by him has been accepted as the standard beehive all over the world, where beekeeping is carried on according to the scientific principles connected with it.

I will now say a few words about the methods adopted by the Queensland beekeepers.

A very large proportion of the bees in Queensland is kept in common boxes, generally gin or kerosene cases. When the owner feels inclined to have some of Nature's sweet, he turns the box, bees, and honey upside down; then he cuts the honey out in the best way that he can. If the person is careful the insects do not suffer so much, but still the bees' brood-nest is spoilt, and it takes some time before they recover from the shock. In some cases, the bees abscond. The above method I strongly condemn, considering the numerous appliances there are to assist man to manage bees more successfully.

But this primitive plan is fast being replaced by the more up-to-date method, as practised by few beekeepers in Queensland at present. The beehive most commonly used is the 10-framed dovetailed Langstroth hive. In America and most other places, the Langstroth hive is used with the flat cover, but after using the ventilated gable cover, patented by A. J. Root, of America, I find that it is the best cover to use in this climate. This cover keeps the inside of the hive at an even temperature throughout the hot summer months. The bees enter the supers and top stories better, and are not hunted down to the bottom of the hive, as is the case when the flat covers are used. The gable cover also prevents the sagging of combs in the frames (a serious trouble to contend with), and sheds the water better than the flat cover.

The management of bees in the 10-frame Langstroth hive is greatly assisted by using the following articles:—Honey-extractor, uncapping can and knife, comb foundation for the frames, foundation fasteners, wire for the frames, wire imbedders, bee-smokers, bee-veils, &c.

Bees.—There are two kinds of bees used in Queensland: the black, commonly called the English bee; and the Italian bee.

The Italian bee is reckoned by all the prominent beekeepers of America and Europe as the most useful one, the queen being very prolific, and the workers unsurpassable as honey-gatherers. They are easier managed, and less liable to diseases than other bees. They think nothing of killing the bee-moth, the only pest that Queensland beekeepers have to guard against. The diseases known as foulbrood and dysentery, which played such havoc in some American apiaries some years ago, are not found here.

Although Queensland is so well adapted to the honey bee, the people, up to the present, have not given apiculture the attention it deserves. The honey produced is second to none.

FIRST STEPS IN BEE-KEEPING

No. 1.

By H. R. STEPHENS,
Busy-Bee Apiary, Toowoomba.

As a new season will soon be here, it behoves bee-men to be ready with sufficient hives, frames, &c., to provide for the increase of colonies which, where the bees have wintered well and have a prolific queen, soon results in early swarms. It is best to unite colonies that are weak at the end of the winter, keeping the better queen of the two—as bees should enter spring as strong as possible, to reap the advantages of early swarms and surplus honey. Those who contemplate becoming bee-men, or women either, by keeping one or two hives for supplying their own households with honey, or as a business, should certainly make an early start in the spring. September is a good month to get a strong colony of bees in. A Langstroth hive, which has either 8 or 10 frames—usually 10—and a complete hive for extracted honey, consists of two exactly similar pine boxes, without either top or bottom, with a rebate at either end to hang the frames in. As some of my readers may wish to make the boxes for themselves: I will give the dimensions, which are—20½ inches long, 16 inches wide, and 9½ inches deep, outside measurement; and the boards are ¾-inch thick, or 1 inch will do for making a hive or two, as the bees have no time to spend criticising the house they occupy, and only require a simple construction for their welfare. A flat or gable cover and a bottom board, raised on cleats ¾-inch thick, to form an entrance, are also required.

Between the two boxes, when in position, is placed a zinc honey-board or queen excluder, the object of which is to prevent the queen going into the super and laying there, as also to keep the drones in the bottom hive, which is termed the brood nest, the upper one being the super or box in which surplus honey is stored. The operation of examining bees in a frame hive with a super on is conducted as follows:—Lay the cover on the ground; then lift the super and place on the cover, and, as the mat is on the top of the frames, the bees are kept from troubling the operator whilst the lower hive is being examined. The next thing is to take off the excluder and put on one side; then lift out one of the centre frames, if it will come out easily. If not, a side frame, which usually contains honey, will have to be removed to make room. When you have a good frame of brood, look particularly for worker eggs, and generally note whether there is much drone brood, or at the proper time look for queen cells, as these imply swarms or loss of queen. It is not necessary to see the queen each time the hive is opened, as, if worker eggs are seen, a queen must have been present within the previous three days, as it takes that time for the egg to hatch. When examining your bees, it will save much trouble in lifting out the frames if the propolis and wax are cleaned off each time, and for this purpose a square-mouthed trowel, with about 2-inch sides, is very handy.

Tropical Industries.

MANURING OF TROPICAL PLANTS—COTTON.

The cotton plant requires, in the first place, a deep, permeable soil, preferably a sandy loam. The tap root of this plant often descends more than 3 feet into the ground, and, during the four and a-half to five and a-half months of vegetation, it is compelled to draw its supply of moisture from the deeper layers of the soil. Heavy clay and sour humus soils are not suitable for the proper cultivation of this plant, and shade should be avoided, as the cotton plant requires light. Arrangements should be made for artificial irrigation in all localities where the amount of rain that falls between the beginning of the vegetation and harvest time is an uncertain factor.

Investigations in America have established the following figures for the amounts of various substances removed from 1 acre by an average crop of 300 lb. of fibre and 654 lb. of seed :—

| | lb. | | lb. |
|---------------------|-------|--------------------|------|
| Nitrogen ... | 20.80 | Lime ... | 1.68 |
| Phosphoric acid ... | 6.84 | Magnesia ... | 3.67 |
| Potash ... | 9.85 | Sulphuric acid ... | 1.10 |
| Soda ... | 0.20 | Insoluble ... | 0.23 |

Dr. Wohltmann* gives the following figures for the average analysis of American Sea-Island Cotton :—

| | STEMS. Per cent. | LEAVES. Per cent. | FIBRES. Per cent. | SEED. Per cent. |
|---------------------|---------------------|----------------------|----------------------|--------------------|
| Pure Ash ... | 1.81 | 7.9 | 1.12 | 3.8 |
| containing— | | | | |
| Lime ... | 34.8 | 34.5 | 20.4 | 4.7 |
| Magnesia ... | 3.4 | 1.3 | 4.0 | 18.2 |
| Phosphoric acid ... | 17.5 | 18.7 | 15.5 | 29.0 |
| Potash ... | 17.4 | 15.5 | 29.2 | 33.8 |
| Soda ... | 13.3 | 8.9 | 13.5 | 9.9 |
| Oxide of iron ... | 4.8 | 3.2 | ? | ? |
| Chlorine ... | 2.1 | 6.9 | 6.2 | 1.1 |
| Sulphuric acid ... | 2.3 | 5.6 | 6.3 | 1.2 |
| Silicic acid ... | 4.1 | 6.7 | 4.0 | 0.3 |

The application of nitrogen to cotton is absolutely indispensable, on account of the short growing season of this plant. The plant-food contained in the stems and leaves is, as rule, returned to the soil by ploughing them under. However, if the stems and leaves, instead of being ploughed under, are burned on the fields—a custom that is still prevalent in many sections—the nitrogen contained in them will be lost.

The fibres and seed are removed from the field, and used in industrial manufactures; the plant-food ingredients contained in the fibres and seed will, therefore, be lost, if the residue obtained in preparing oil from the seed—viz.,

* Dr. Wohltmann, die natürlichen Factoren der tropischen Kultur, 1892.

oil-cakes—is not returned to the soil in the form of a fertiliser. These oil-cakes were formerly almost exclusively employed as fertilisers, but, as they have proved to be more economical when used for feeding cattle, they are now being replaced by the more valuable commercial fertilisers.

Very detailed fertiliser experiments on cotton have been conducted at the Agricultural Experiment Station at Auburn, Alabama, U.S. The following table represents the results of a series of single trials, arranged according to the nature of the soil. The soils are intended to represent the various grades of the several kinds selected:—

FERTILISING EXPERIMENTS ON COTTON IN ALABAMA, U.S.A.*

| No. of Plot | Fertilisers applied per Acre in lb. | Loamy Soil ; Subsoil: Loamy Average of— | | Sandy Soil ; Subsoil: Loamy Average of— | | Sandy Soil ; Subsoil: Sandy Average of— | | Calcareous Prairie-Soil; Subsoil: Clay. | Total Average of all Yields, Increase over Average of Unfertilised Plots (480 lb.) | Cost of Fertilisers per Acre. | Cost for each 100 lb. of Increase. |
|-------------|-------------------------------------|---|-------------------------------|---|-------------------------------|---|-------------------------------|---|--|-------------------------------|------------------------------------|
| | | 9 experi- mental plots, 1891. | 6 experi- mental plots, 1892. | 8 experi- mental plots, 1891. | 7 experi- mental plots, 1892. | 3 experi- mental plots, 1891. | 3 experi- mental plots, 1892. | | | | |
| | | Yields per Acre. | | Yields per Acre. | | Yields per Acre. | | | | | |
| | | lb. | lb. | lb. | lb. | lb. | lb. | lb. | | Dollars. | Dollars. |
| 1 | 96 lb. Nitrate of soda ... | 375 | 596 | 476 | 454 | 557 | 621 | 480 | 505 | 69 | 2.13 |
| 2 | 240 „ Acid phosphate ... | 573 | 613 | 684 | 655 | 837 | 877 | 480 | 678 | 242 | 1.98 |
| 3 | 64 „ Muriate of potash ... | 435 | 493 | 452 | 507 | 448 | 760 | 448 | 497 | 61 | 1.44 |
| 4 | No fertiliser ... | 312 | 365 | 441 | 339 | 380 | 723 | 384 | 421 | | 2.36 |
| 5 | 96 lb. Nitrate of soda ... | 398 | 536 | 623 | 595 | 496 | 829 | 576 | 579 | 143 | 3.57 |
| | 64 „ Muriate of potash ... | | | | | | | | | | |
| 6 | 96 „ Nitrate of soda ... | | | | | | | | | | |
| | 210 „ Acid phosphate ... | 763 | 743 | 873 | 987 | 904 | 1,048 | 736 | 865 | 429 | 4.11 |
| 7 | 64 „ Muriate of potash ... | | | | | | | | | | |
| | 240 „ Acid phosphate ... | | | | | | | | | | |
| 8 | No fertiliser ... | 316 | 355 | 428 | 387 | 347 | 731 | 352 | 417 | | 1.16 |
| 9 | 96 lb. Nitrate of soda ... | 893 | 887 | 973 | 978 | 891 | 1,186 | 800 | 944 | 508 | 5.55 |
| | 240 „ Acid phosphate ... | | | | | | | | | | |
| | 64 „ Muriate of potash ... | | | | | | | | | | |
| 10 | 240 „ Floats ... | 493 | 479 | 619 | 645 | 637 | 896 | 416 | 598 | 162 | 1.88 |
| 11 | 240 „ Floats ... | 539 | 613 | 733 | 807 | 704 | 1,061 | 640 | 728 | 292 | 4.01 |
| | 96 „ Nitrate of soda ... | | | | | | | | | | |
| 12 | No fertiliser ... | | | | | | | | | | |
| 13 | 848 lb. Green cotton-seed ... | 561 | 588 | 813 | 806 | 821 | 869 | 480 | 705 | 269 | 3.81 |
| 14 | 848 „ Green cotton-seed ... | 731 | 697 | 818 | 928 | 829 | 909 | 512 | 775 | 339 | 5.69 |
| | 240 „ Floats ... | | | | | | | | | | |
| 15 | 4240 „ Stable manure ... | | | | | | | | | | |
| 16 | 240 „ Acid phosphate ... | 776 | 878 | 876 | 930 | 1,045 | 1,040 | 280 | 832 | 396 | 4.24 |
| | 240 „ cotton-seed meal ... | 744 | 760 | 930 | 1,023 | 914 | 933 | 896 | 886 | 450 | 4.58 |
| | | | | | | | | | | | |

* Agricultural Experiment Station, Auburn, Ala., U.S.A., Bulletin No. 34, January, 1892, and Bulletin No. 42, January, 1893.

The great difference between these results and those obtained in Mississippi is undoubtedly due to the small quantities of fertilisers used in the former trial.

As regards the fertilisation with single plant-food ingredients (Plots 1, 2, and 3), phosphoric acid not only gave the largest yield, but the cost of producing the increase was lowest for this material. The much smaller increases on the unfertilised plots, obtained by potash or nitrogen alone, are almost the same, but potash is the cheaper. These yields are, however, considerably smaller than those obtained from phosphoric acid. On the plots (5, 6, and 7), to which two of the plant-food ingredients were applied, the largest increase was produced by the combination of phosphoric acid and nitrogen, and the cost for each 100 lb. of this increase was lower than in the case of the other two combinations. The mixture of phosphoric acid and potash comes next, both as regards the increase, in yield and the lessened cost, while nitrogen and potash, in comparison with the two other combinations, produced the smallest increase at the highest cost. The combination of all three ingredients (Plot 9) yielded the largest increase, and, although the cost of the mixture per acre was highest in this

instance, the cost for each 100 lb. of increase compared favourably with that of the other applications. The second largest yield was produced by a mixture of acid phosphate and cotton-seed meal (Plot 16), of which the cost was somewhat smaller, and next in amount of yield comes the plot that received stable-manure (Plot 15). Floats alone, and especially in combination with nitrate of soda (Plots 10 and 11), produce an excellent and comparatively cheap increase, while the mixture of floats and green cotton-seed (Plot 14) yields a considerable increase, though at a higher cost.

The effect of various fertilisers upon the time of maturity of cotton was also tested in these trials. This is a question of supreme importance, because prices are generally better at the beginning of the season. Moreover, the time of picking depends upon the weather, soil, and maturity of the plant, and these factors may also necessitate a second or third picking. According to the reports of the Auburn Station, the picking of the cotton on the various experimental fields extends from the last week of August to the beginning and sometimes even to the end of December. In the following table, the averages of the results obtained are given. For the sake of easier comparison, the first and second pickings are entered in the columns headed "First Picking," and the third and fourth in the columns headed "Second Picking." The results have been arranged according to the various fertilising materials, and not according to the numerical order of the plots. The quantities of fertilisers applied to the various plots are the same as those applied to the corresponding plots in the table above.

RESULTS OF FERTILISATION UPON COTTON. AUBURN STATION.

| No. of Plot. | I. Loamy Soil; Subsoil: Loamy. | | II. Sandy Soil; Subsoil: Loamy. | | III. Sandy Soil; Subsoil: Sandy. | | IV. Calcareous Prairie Soil; Subsoil: Clayey. | |
|---|--------------------------------------|--------------------|---------------------------------------|--------------------|--|--------------------|---|--------------------|
| | First Picking. | Second Picking. | First Picking. | Second Picking. | First Picking. | Second Picking. | First Picking. | Second Picking. |
| PERCENTAGE OF TOTAL YIELD. | | | | | | | | |
| A.—NO FERTILISER. | | | | | | | | |
| 4. | 52·72 | 41·28 | 54·35 | 45·65 | 59·93 | 40·07 | 25·00 | 75·00 |
| 8. | 55·69 | 44·31 | 57·40 | 42·60 | 65·23 | 34·77 | 27·30 | 72·70 |
| 12. | 61·41 | 38·59 | 56·61 | 43·39 | 65·29 | 34·71 | 22·20 | 77·80 |
| Average. | 58·61 | 41·39 | 56·12 | 43·88 | 63·48 | 36·52 | 24·83 | 75·17 |
| B.—NITROGEN. | | | | | | | | |
| 1. | 54·77 | 45·23 | 56·68 | 43·32 | 64·38 | 35·62 | 40·00 | 60·00 |
| C.—PHOSPHORIC ACID. | | | | | | | | |
| 2. | 73·54 | 24·46 | 71·56 | 28·44 | 63·39 | 36·61 | 26·67 | 73·33 |
| D.—POTASH. | | | | | | | | |
| 3. | 55·56 | 44·44 | 55·66 | 44·34 | 61·68 | 38·32 | 28·60 | 71·40 |
| E.—NITROGEN AND POTASH. | | | | | | | | |
| 5 | 56·67 | 43·33 | 51·94 | 48·06 | 58·36 | 41·64 | 38·90 | 61·10 |
| F.—NITROGEN AND PHOSPHORIC ACID. | | | | | | | | |
| 6 | 78·70 | 21·30 | 74·37 | 25·63 | 65·80 | 34·20 | 34·80 | 65·20 |
| G.—POTASH AND PHOSPHORIC ACID. | | | | | | | | |
| 7. | 72·61 | 27·39 | 68·06 | 31·94 | 68·34 | 31·66 | 28·00 | 72·00 |
| H.—NITROGEN, POTASH, AND PHOSPHORIC ACID. | | | | | | | | |
| 9. | 76·82 | 23·18 | 71·07 | 28·93 | 67·75 | 32·25 | 40·00 | 60·00 |
| J.—STABLE MANURE. | | | | | | | | |
| 15 | 76·24 | 23·76 | 75·48 | 24·52 | 71·37 | 28·63 | 27·50 | 72·50 |

The fertiliser applications and yields, calculated per acre, are given in the following table :—

| No. of Plot. | Fertilisers Applied per Acre, in lb. | Yields (fibre and seed) per Acre. | Increase over Unfertilised Plot. |
|--------------|--|-----------------------------------|----------------------------------|
| 1 | No fertiliser | lb. 760 | lb. |
| 1a | 2,000 lb. lime | 780 | 20 |
| 2 | 615 ,, acid phosphate and 200 lb. nitrate of soda | 2,115 | 1,355 |
| 2a | 615 ,, acid phosphate, 200 lb. nitrate of soda, and 2,000 lb. lime | 1,930 | 1,170 |
| 3 | 615 ,, acid phosphate, 200 lb. nitrate of soda, and 120 lb. muriate of potash | 2,640 | 1,880 |
| 3a | 615 ,, acid phosphate, 200 lb. nitrate of soda, 120 lb. muriate of potash, and 2,000 lb. lime | 2,550 | 1,790 |
| 4 | 615 ,, acid phosphate, 200 lb. nitrate of soda, and 240 lb. muriate of potash | 2,345 | 1,585 |
| 4a | 615 ,, acid phosphate, 200 lb. nitrate of soda, 240 lb. muriate of potash, and 2,000 lb. lime | 2,170 | 1,410 |

The following report was made in connection with this experiment :—Better results would have been obtained, if the weather at the beginning of the season had not been exceptionally unfavourable. It is evident from the result of the experiment that phosphoric acid is the regulating ingredient, though the addition of potash to the phosphoric acid and nitrogen made a still larger increase (about 10·50 dollars per acre), which more than paid for the cost of the fertiliser.

Lime was of no value to the cotton, as it was applied in the spring, and other observations have shown that lime is of little service to crops of cotton when applied later than December of the previous year. The soil upon which the experiment was conducted does better with cotton-seed meal as a source of nitrogen than with nitrate of soda.

Experiments conducted in the cotton section of the United States have shown that the application of kainit to cotton prevents the development of a disease of this plant, called yellow leaf blight.

Dr. Atkinson remarks in his report :—“ Yellow leaf blight or cotton is, some years, very destructive. It is likely due to both improper nutrition and unfavourable physical condition of the soil. The experiments show that, by the use of kainit, leaf-blight is largely, if not entirely prevented, and the yield of cotton increased. This is corroborated by many farmers.”

In all of these plots, it was easy to see, by comparison with the others, that the entire or partial prevention of the disease was due to the kainit.

The yield of the kainit plots is from 70 per cent. to 100 per cent. above those where no fertiliser was used, and an average of 40 per cent. over that of any other fertiliser or combination, used without the kainit.

A report upon similar experiments, conducted at Hope Hull on black, loamy soil, was made by Mr. A. H. Clark :—

“ There can be no doubt as to the effect of kainit, as my former experience is the same as that of this year, but I think it would require not less than 500 or 600 lb. of kainit per acre to thoroughly prevent the disease.”

These results have been confirmed by other experiment stations and by farmers, for instance, by Dr. H. B. Battle, of the North Carolina Station, as early as 1888.

HANDLING HEAVY PIPE TOBACCOS.

By R. S. NEVILL,
Tobacco Expert.

THERE are several causes why the pipe tobaccos grown in Queensland have not the desirable qualities of the best American, and some of them are chargeable to the manner of handling after the crop is grown. Many farmers seem to think that the period of careful management is over when the harvest time has come, when really it is the time for greatest care and intelligent work. Open sheds are not the best; the tobacco is thus exposed to all sorts of weather, and conditions cannot be controlled; it cures unevenly and irregularly, producing many sorts in the one shed. The tobacco should not be crowded in the shed or on the sticks, as it cannot get ventilation, and cures green, and consequently bad flavour, and if the weather be hot it is liable to scald and become dead and worthless. Tobacco has not finished its cure as soon as dried out; it still retains objectionable matter that must be either modified or eliminated altogether, and this is accomplished by continued hanging.

Heavy tobaccos put into the bulk as soon as dried do not have the aroma that is in those that have been hung for two or three months longer. It may be stripped and put into hands, but should be re-hung to finish the cure; in fact, it is preferred that it should be stripped soon after it has dried.

In stripping, the green or greenish should be put in hands to itself, and they should be small, not more than twelve or fourteen leaves each, and hung where light and air can get to it; if the hands are large, the leaves in the centre will not bleach out, but remain green. It is best to tie all of the tobacco in small hands, as it will continue the cure more uniformly, can be ordered more irregularly, and handled more neatly.

Assorting should be carefully done, that the tobacco may have a uniform appearance, care being taken to put nothing with the best grade, or No. 1, that does not belong there; carelessness in this often causes a lower figure to be paid for it, and *sometimes gives trouble with the purchaser, when he has to reassort it.* Every hand should be tied with a leaf of the same colour as the tobacco in that hand, not necessarily a good leaf, but the hand should be and look uniform. Please the eye and you please the purchaser, and the grower that establishes a reputation for neat and proper handling of his crop always gets top prices, for all the buyers want his tobacco, as it gives them no trouble.

Before bulking, it should be thoroughly dried out in the heads, and bulked as it comes into condition, and not when it is drying out, for then the stem may be surcharged with moisture that will be taken up by the leaf, and the whole get too soft and funk.

The proper condition for bulking is when it is just pliable and the midrib or stem will snap halfway down the leaf. The proper condition can be determined by taking the tails in the hand and squeezing them together; if they fall apart slowly after removing the pressure, it is right for bulking, but if they stick together it is too soft, and had better be left hanging.

In bulking, the floor should be well off the ground, and so arranged that the dampness arising from the ground cannot penetrate through to the tobacco. The bulks should be large, not less than 8 or 10 feet wide, and as long as may be convenient; this allows the tobacco to sweat uniformly and continuously, not being disturbed by weather conditions; whereas narrow bulks sweat fitfully, some days lightly, and on other days not at all, owing to the state of the weather. This is important, as tobacco that does not sweat properly does not develop desirable qualities. The bulk should be well covered at sides and on top.

The bulking should be done about the time summer weather is beginning, that the tobacco may not be chilled when it goes in the bulk, and the weather conditions can be depended on for favourable results.

It should remain in bulk four to six weeks before prizing. It must be borne in mind that the sweating of these tobaccos is an entirely different process to the sweating of cigar leaf.

Forestry.

FELLING TIMBER IN THE TROPICS DURING THE WANING MOON.

MR. D. H. Maury, engineer and superintendent of the Peoria Waterworks Company, Illinois (U.S.A.), writes as follows to *Engineering News* :—

In your issue of 11th May, I note an abstract from a paper read by Mr. Ernest R. Woakes, before the American Institute of Mining Engineers, the item quoted relating to the necessity in the tropics of felling timber during the waning moon. I can entirely corroborate Mr. Woakes's statements in this connection, and I am all the more glad to do so because he is an old friend, as I happened to be for several years engaged in engineering work near him in Columbia, South America.

It was an absolutely invariable rule there that all timber should be felled in *menguante*, or during the waning of the moon. The *creciente*, or the periods of the moon's increase, was employed in sawing the felled timber, all work having to be done by hand with a pitsaw. I have repeatedly tested the effect of the tropical moon on timber. On one occasion, in building a fence of the native bamboo, I had all the bamboo cut from the same thicket, and felled it all, except enough for one panel, during the waning moon. This one panel, which was cut while the moon was waxing, turned black in a few days, and had begun to rot in less than six weeks. The rest of the fence grew white and hard, and was in perfect condition when last I saw it, some three years after it was built. In making clearings for mining work, I have frequently noticed the rise and fall of the sap in the stumps of the felled trees, and have observed the sap to continue during each *creciente* to run out of the pores on the top of the stump down the sides of the stump for several months after the tree had been felled. During *menguante*, the same stump would be dry.

CALIFORNIA REDWOOD.

CALIFORNIA redwood (says Mr. Henry Gannet, in the *National Geographic Magazine*) covers an area of about 2,000 square miles, lying in a narrow strip along the Pacific coast, chiefly between San Francisco Bay and the Oregon boundary. The present "stand" of timber is roughly estimated at 75,150,000,000 feet B.M.; and the annual cut is 250,000,000 feet B.M. This tree is exempt from destruction by fire, as it contains no resin, but has in it much water, and will not burn when green. It is a cheap timber, worth 14 dollars (£2 18s. 4d.) per 1,000 feet in Eureka for the best. A redwood forest is probably the densest forest on earth, both from the size of the trees and their closeness. The sun never shines about the base of these trees.

The New York State College of Forestry, which was recently established under the direction of the University of Maine, U.S.A., has planted, so far this spring, 50 acres of Adirondack burned land with white pine and other conifers. The work was performed by wood-choppers, who had during the preceding winter felled 3,000,000 spruce-trees. A nursery has also been started, which, inside of two years, will furnish 3,000,000 seedlings, or enough to plant 2,500 acres. The intention is to plant each year fully 500 acres, which can be done, according to Director Fernow, for about 3 dollars (12s. 6d.) per acre.

CANADIAN FORESTS.

THE forests of Canada (says United States Consul-General Billinger, of Montreal) cover a total area of 3,315,647 square miles, of which 1,248,798·59 miles may be classed as woodland, with 37·6 per cent. of wood. In this table of area of woodland, 696,952 square miles are credited to the north-west territories, and 258,554 square miles to British Columbia. Ontario and Quebec provinces have 102,118 and 116,521 square miles, respectively. The quantity of pine is estimated at follows :—Ontario, 19,404,000,000 feet B.M.; Quebec, 15,734,000,000 feet B.M.; and the other provinces, 2,200,000,000 feet B.M.; or a total of 37,338,000,000 feet B.M. The annual cut, at a low estimate, is about 1,000,000,000 feet B.M. British Columbia is said to possess the largest compact timber resources in the world; the estimate of the Douglas pine, cedar, spruce, Alaska pine, &c., standing in the railway belt amounts to 25,000,000,000 feet B.M., worth 25,000,000 dollars. In 1897 Canada exported to the United States and to Great Britain manufactured forest products to the value of 1,715,792 dollars; and the total manufactured and unmanufactured is put down at 33,046,329 dollars. In a table of forest areas in various countries, in acres, Canada is credited with 799,230,720 acres; Russia with 498,200,000; the United States with 450,000,000; India, 140,000,000 acres; and all other countries are under 50,000,000 acres.—*Engineering News*.

FORESTRY IN IRELAND.

THE *Pastoralists' Review* says :—A very interesting lecture on Irish forestry was delivered before the Royal Dublin Society last week. It was shown that Ireland had only about $1\frac{1}{4}$ per cent. of the land under timber, while Scotland had $4\frac{1}{4}$ and England $5\frac{1}{4}$ per cent. Ireland was far behind England in this matter. Of the waste lands of the United Kingdom, 4,000,000 acres in England and 2,000,000 acres in Ireland might be planted; these with the 3,000,000 under timber would give 9,000,000 acres, which should yield an income of £20,000,000 per annum if properly managed. Nine million loads of timber are imported into the kingdom each year, and this vast sum of money might be kept at home if this additional 6,000,000 acres were planted. The supply of timber from the Baltic is decreasing every year; Canada could not be relied on as in former years; India had only sufficient for her own requirements; Australia was fast cutting down her natural forests; and altogether things pointed to a sure but not too slow scarcity of timber.

FOREST DENUDATION.

A STRONG effort is being made in the United States to check the denudation of forests going on there. In four of the great lumber States this is progressing at the rate of 1,700 square miles per annum. Valuable evidence of the effect of reckless timber-getting to Australians is offered in connection with this matter. River levels are lowered, lakes dried up, and regional rainfall seriously interfered with.

Science.

FOOD VALUE OF GUINEA-GRASS (*PANICUM MAXIMUM*).

IN order to ascertain the food value of this well-known forage plant, the Director of the Botanical Department, Trinidad, experimented with a plot of one-tenth of an acre, planted during the year 1897.

After four cuttings had been taken off, it was determined to weigh the crop of a cutting, to ascertain what was the yield per acre when freshly cut. The grass obtained at the first cutting weighed 3,012 lb., or at the rate of 13·4 tons per acre.

The above result led to the determination to keep a year's record.

In order, however, to obtain correct values, several deductions must be made.

It is a well-known fact to all who use it that a very large proportion of this grass is wasted by animals, and not consumed—*i.e.*, wasted—as food, but serves as bedding, and eventually becomes available to the agriculturist as manure; but when we are considering food value simply, the waste must be properly ascertained.

In order to discover how much loss actually occurs, a known weight of freshly-cut grass was taken, and all the waste portions carefully removed by hand, so that its value might be compared with fodders where the waste is comparatively trifling. The average waste of two samples of 100 lb. each was nearly 33 per cent., so that the actual weight of undried fodder, per acre, at the one cutting, is 8·98 tons.

Compared with English or American hay at 4 or 5 tons to the acre of dried material, we obtain a fair idea of its value. The yield of 8·98 tons, when reduced to air-dry weight, is lessened by 5·65 tons, leaving 3·33 tons as a crop. The air-dry weight of the European analysis is always less than the air-dry weight of the tropics, and this must be taken into account when attempting to ascertain the relative value of any kind of fodder. The air-dry weight of guinea-grass will, therefore, be more in proportion than the air-dry weight of hay ascertained in Europe. How much is to be allowed for this cannot be ascertained until we have an analysis of European or American hay made in the tropics.

In the tropics there is little or no real cessation of growth, and the rest of plants is generally taken in the dry season, when there is less growth than at any other time of the year; but growth goes on all the time with guinea-grass, the rate being regulated by the rainfall. Hence, from the tenth of an acre of which we write, no less than six crops were obtained during the year 1898, cut at the times detailed in the following table:—

| | | | | | |
|---------------|-----|-----|-----|-----|------------|
| 12th February | ... | ... | ... | ... | 3,012 lb. |
| 2nd April .. | ... | ... | ... | ... | 2,120 " |
| 15th July ... | ... | ... | ... | ... | 3,761 " |
| 5th September | ... | ... | ... | ... | 3,569 " |
| 22nd October | ... | ... | ... | ... | 2,682 " |
| 9th December | ... | ... | ... | ... | 1,659 " |
| | | | | | <hr/> |
| | | | | | 16,803 lb. |

The cuttings were made when the grass was fit to cut—*i.e.*, when in the condition it is generally used for horse feed—and the total weight reaped during the year, as seen by the table, was 16,803 lb., or at the rate of 168,030 lb. or 75 tons per acre.

The loss in weight by air drying, proved by actual experiment, was at the rate of 63 lb. per 100 lb.; so that the total dry weight of the crop grown upon our piece of ground was 62,180 lb., or 27·75 tons per acre annually. Making the reduction of 33 per cent. for unedible portions, we have a total of 18·60 tons of air dry guinea-grass as the return per annum from one acre.

The experiment would be incomplete without a description of the ground on which the crop was grown, I therefore append it. The piece of land in question, had for several previous years been used for the growth of vegetables—in fact, until it had become quite “sour” and useless for this purpose, as little or nothing would grow upon it, either with or without manure, lime, &c., &c.

It had had during the time vegetables were growing upon it frequent applications of manure, but no heavy dressings, and no manure at all was applied for some time previous to its being planted with guinea-grass, and during the growth of the guinea-grass no manure of any kind whatever was applied. It was situated adjoining a field supplying grass to Government House, and little difference was to be observed between the growth on the measured patch and the ordinary field, which was cut at similar intervals during the year.

It will therefore be seen that the yield obtained is from ordinary ground without tillage or manure.

On the last crop being taken the grass roots were removed, the ground again being suitable for the cultivation of vegetables, &c.

The analysis of guinea-grass as grown in Trinidad at the cattle farm, is given by Mr. Meaden in the proceedings of the Agricultural Society, as follows:—

| | Moisture. | Albuminous Compounds. | Carbonaceous Principles and Woody Fibre. | Mineral Matters. | Ash. |
|---------------------|-----------|-----------------------|--|------------------|------|
| Guinea-grass | 18·90 | 7·80 | 58·32 | 14·97 | |
| Clover hay | 11·67 | 7·30 | 72·03 | 9·01 | 4·14 |
| Vetch | | 8·25 | 86·07 | 5·68 | 6·3 |
| Bahama-grass | 15·50 | 6·59 | 65·94 | 11·95 | |
| Para-grass | 15·50 | 5·24 | 69·97 | 9·28 | |

* See moisture of Vetch in Church's analysis below.

It is not stated in the analysis whether the moisture in the guinea-grass is that of the air-dried product, but it is evident that were less moisture present, it would compare more favourably with other fodders, the analysis of which is given in the table.

In Church's food grains of India, the analysis of the vetch differs considerably from that of the table he gives—

VETCH (*Vicia sativa*, Linn.)

| | |
|--------------------|-------|
| Water | 10·10 |
| Albumenoids | 31·50 |
| Starch | 47·60 |
| Oil | ·90 |
| Fibre | 6·70 |
| Ash | 3·20 |

100·00

Church also remarks that albumenoids in Indian vetches are rather high, the average European sample giving 27·5 per cent. only.

It would appear therefore that the food value of guinea-grass is not so high as has been commonly supposed, although as a fodder plant it must always take first place on account of the large and continuous crops which it affords.

Mr. Meaden records that he put manure upon his land, in a well rotten condition to the depth of eight inches, and that he grew guinea-grass at the rate of 118 tons to the acre harvested at one cutting, and in the dry season. This would be accounted for by the fact that during the dry season the grass is actually heavier, owing to the larger quantity of woody fibre, the removal of which would probably give a loss of some 60 or 70 per cent., instead of the average I have taken, of some 33 per cent., especially when a "depth of eight inches" of well rotted manure has been applied to the surface. This, coupled with a due proportion of loss for air drying, would considerably reduce the value of Mr. Meaden's crop, but it would probably still leave guinea-grass of the highest value among our local fodders.

Guinea-grass, and, in fact, all grasses when cut at the proper time, *i.e.*, when the flower spikes are fully formed, contain much more nutriment than when cut young, and seeing the large percentage of water in guinea-grass when freshly cut, it is no wonder that in Trinidad we hear the statements that it renders animals liable to colic, diarrhoea, &c., &c.

If the grass is left to become too "bony," there is again great waste, for it has been seen what a very large percentage of it in this condition is unfit for animal consumption. Cut at the right period it makes first-class hay; but in the climate of Trinidad it is a very difficult matter to secure weather suitable for the operation, as when the grass is plentiful, there is little fine weather, and when the weather is suitable, there is little grass. Guinea-grass, however, is, all things considered, the most economic of all the grasses for feeding purposes for both horses and cattle. I am fully aware that there is considerable prejudice against its use for milking cattle, as it is asserted that it causes cows to "go dry."

Probably this idea would prove on examination to be merely insular prejudice, but personally I cannot either affirm or deny the proposition. I know, however, that in Jamaica, cows are fed upon guinea-grass.

THE DIVINING ROD.

A CORRESPONDENT, writing to the *Australian Pastoralists' Review*, says:—

As I am a firm believer in the efficacy of the divining rod, your article on it in the *Review* of the 15th instant attracted my attention, as it should that of all who have to do with sinking for water in dry country. Sceptics may scoff, and unbelievers laugh as they like, but I assert there is a virtue in the divining rod; that it will indicate where underground streams are flowing, and that with certainty and accuracy when used by a person in whose system there is more than the average amount of electricity. The person holding the rod is, as it were, the battery, and, by holding the rod (I use a copper wire bent in a semicircle) at arm's length with one end of the rod towards him, will continue to attract it until he passes over something possessing a greater power of attraction than his body. If you hold the rod so tightly in your hand that it cannot twist round, it will rise up fully 45 per cent. if the subtle power arising from the earth be fairly strong.

Upon one occasion, when experimenting with the rod in the south-west of South Australia, it rose to perpendicular, and then dipped slightly from me. When you have passed beyond the greater attraction than is possessed by the "diviner," the point of the rod will turn towards the holder.

I have found the rod work better in summer than winter—sultry weather for choice.

What the subtle and hidden influence is which causes the rod to work in some men's hands, and not in others, will surely be discovered by someone, when it will be found it is, perhaps, the simplest thing possible.

I do not wade into science, and rarely "theorise," but my idea is that gases are generated by the water passing through chemical and mineral substances and escaping to the surface.

Where the rod indicates water, the depth at which it may be struck can also be ascertained within a few feet with the rod. It will not determine whether fresh or mineralised water will be found, for that one can only go by surface indications.

Many people wonder how it is fresh and brackish or even salt water is struck in wells a few yards apart. It is, however, easily accounted for. Water generally flows in channels under the earth's surface, and starts fresh from its source, hundreds of miles away, perhaps passing through salt country in its course. It necessarily follows that much of the water will escape by infiltration, form into lesser streams, and, owing to the soil being saline or mineralised, the water in these lesser channels becomes the same, whereas that in the main channel, by reason of its flowing rapidly and continuously, remains fresh. If in sinking for water you miss the main stream, and strike a subsidiary one, the result is bad water. It is a well-known fact that most underground streams are serpentine, so that 50 wells might be sunk but not one of them in the right spot. Imagine the Darling River an underground stream. We know there is an abundance of fresh water there. At the same time 100 wells could be sunk and all of them might happen to be on the *berids*, in which case either there would be no water or it would be salt, though perhaps within 20 feet of the river. This is where the divining rod is of service.

[We can vouch for the efficacy of the divining rod, having seen it successfully worked in Switzerland; and some years ago at Forest Hill, near Laidley, a Dane found a spring of water by the use of an iron bar. The hilly country around Forest Hill is very badly watered—in fact, in the scrub there is no water in any direction, yet the spring discovered by the Dane is full to this day.—Ed. Q.A.J.]

Animal Pathology.

TUBERCULOSIS IN CATTLE.

(Bulletin by DUNCAN McEACHRAN, F.R.C.V.S., D.V.S., Chief Veterinary Inspector for Canada.)

IN issuing this bulletin on a subject affecting very intimately not only the extensive and rapidly growing cattle industries of Canada, but also having a close and direct bearing on the health and lives of the people, an effort is being made to convey to everyone interested, more especially the farmers, dairymen, and stock-raisers, in a condensed form and in non-technical language, a simple statement of facts as to the nature, causes, symptoms, and prevention of this disease.

In the preparation of the bulletin free use has been made of the publications and reports of the best authorities up to date, especially those of Professor Edward Nocard, of Alford Veterinary College, France, Chief Consulting Veterinarian in France; Professor Bang, of Denmark, who was especially employed by the Danish Government to investigate this disease; the report of the Royal Commission appointed by the British Government; the reports of the Bureau of Animal Industries at Washington, U.S.A.; Professor Theobald Smith, Harvard University; Professors Law and V. A. Moore, Cornell University; the late Professor Walley, Edinburgh Veterinary College, &c., as well as of the extensive experience of the veterinary staff of the department.

The statements contained herein are accepted generally by scientific men as facts, and our farmers may accept them as such, care having been taken to avoid making statements on debatable points. The Minister trusts that interested parties will carefully read the bulletin, preserve it for future reference, and apply the suggestions contained therein to their own individual cases.

In the event of an inspector discovering the disease in one or more of the herd, it will be his duty to at once remove them out of the byre to an isolated place, in which they must remain quarantined until otherwise disposed of. The premises must also be disinfected to the satisfaction of the inspector.

INDEMNITY.

As no provision has so far been made by Parliament for the payment of indemnity for animals slaughtered on account of this disease, under ordinary circumstances no indemnity will be paid by the Minister of Agriculture.

TUBERCULOSIS.

This disease claims for its victims nearly, perhaps we might say, all the domestic animals, and few of the wild animals subjected to domestication resist the contagion, as is well known to keepers of menageries. Rats, mice, and other vermin which inhabit houses and outbuildings, not only contract the disease, but are active agents in spreading it.

Some species are more susceptible than others, and contract it readily by eating food containing the germ of the disease, or in inhaling the dried germs given off from the lungs and throats of animals affected in these organs.

The most susceptible of the domestic animals are cattle, swine, chickens, goats, and rabbits. These contract it readily in the natural way, but it can be produced in sheep, dogs, cats, and horses by inoculation with tuberculous material.

Tuberculosis in the lower animals is identical with consumption in the human family. It is due to the same germ (*Bacillus tuberculosis*).

It is communicable from other animals to man, and just as readily from man to the lower animals, by natural infection and by inoculation.

TUBERCLE.

The germs (bacilli), which are living organisms of minute microscopic size, when they reach and become located in a tissue, produce local irritation and the formation of small reddened areas infiltrated with fluid and cells. These are the tubercles. As they become a little older they enlarge, and their colour is greyish or yellow from changes that take place within causing the death of the central tissues. Their appearance and consistence in this way resemble that of cheese.

These nodules may vary in size from a pin-head to a cocoanut; often they are of stony hardness from the presence of lime salts. The tubercles may be confined to one organ or tissue of the body, such as the lymphatic gland, for example, of the mesentery or thorax, or the throat, or udder, or ovaries, &c., or they may be generalised throughout the body, the germs travelling in the blood circulation. In this way the abdominal organs (liver, spleen, kidneys, &c.) may all be involved as well as those of the thorax, lungs, pleura, heart, lymph, glands, &c. Often the pleura and peritoneum are covered with grape-like excrescences whose appearances are characteristic of this disease. Whenever tubercles are lodged for any length of time, much destruction occurs in the affected tissue.

THE TUBERCLE BACILLUS

Is described as a rod-shaped organism with rounded ends and a slight curve, requiring complex laboratory methods of cultivation and staining to prepare it for microscopic study.

It is a parasitic organism, which is only found in the bodies and excretions of animals affected by this disease. It thrives badly in the sunlight, which is said to kill it in from a few minutes to several hours. This fact should be remembered in dealing with it with a view to preventing it.

The invasion of the animal's body by the entrance into it of living bacilli is effected either through the digestive organs (ingestion) or by the respiratory organs (inhalation), by transmission to the sexual organs when the testicle is invaded, and by inoculation, or by a cut or abraded surface.

Without the entrance of the living bacillus into the body, tuberculosis cannot affect it. It is the seed from which it grows, and it is essential to the development of the disease as oats, peas, or potatoes are to reproduce these plants.

WHAT RENDERES CATTLE SUSCEPTIBLE TO THIS DISEASE?

Impaired health, from whatever cause it arises, renders cattle susceptible to tuberculosis. Heredity has been proved not to be an active cause of its propagation; it is, however, a predisposing one, and while it is well established, by the experiments of Professor Bang and others, that calves may be bred from tuberculous mothers, and if removed before the cow licks them, or they have sucked their mother's milk, are placed in absolutely healthy surrounding and fed on milk from healthy cows, they can be reared and remain, so far as any inherited disease is concerned, perfectly free; but common sense will teach us that in such animals we are likely to find a predisposition—that is, a condition favourable to the growth and development of the tubercular bacillus: animals likely to contract the disease when exposed to contagion which their neighbours not so predisposed would resist successfully.

In-and-in breeding is another predisposing cause, by producing animals with reduced vitality. Over-milking, under-feeding, want of sunlight and pure air, insufficient exercise, breeding too young, are all what may be termed predisposing causes to tuberculosis, and should be avoided.

One breed of cattle is just as subject to this disease as another, when subjected to the predisposing and exciting causes. Dairy cattle are most subject to it because they are most exposed, they are more congregated, more closely and continuously housed, their vitality more drained by heavy milking, and they are kept longer. Their calves are more liable to milk infection, as they are fed on mixed milk, whereas the beef breeds usually suckle their calves. The majority of beef cattle are killed off at three or four years old; hence they are exposed to the contagion for a shorter term of life, which is spent more in the open air and in sunlight.

HOW THE DISEASE IS USUALLY INTRODUCED INTO A HERD, AND HOW IT EXTENDS IN IT.

A tuberculous bull is probably the most active agent in spreading this disease, both by cohabitation and sexual connection.

Farmers cannot be over-cautious in buying a bull or in having cows served by one till he has been subjected to the tuberculin test and found to be free from the disease.

Nothing should induce a breeder to allow contact with his healthy cattle by a bull till he has every assurance that he is free from tuberculosis.

Tuberculous animals of any kind should be prevented from coming in contact with the cattle.

TUBERCULOUS ATTENDANTS.

Tuberculous attendants—men or women suffering from pulmonary consumption—should on no account be allowed to feed, milk, or have anything to do with cattle or pigs.

The intercommunicability of the disease from animals to man and from man to animals is an established fact no longer open to discussion.

The bacilli from the throats and lungs of diseased people or animals, being coughed up, adhere to and dry on the woodwork, walls, floors, and feed-boxes in buildings, cattle-trucks, or stockyards, and the dust being moved about by air currents, or mixing with the food in the hay-rack or feed-trough, finds access to the stomach and intestines; thence through the blood or lymph channels to the abdominal glands and other organs.

DANGER FROM MILK.

The virulence of milk from tuberculous cattle, especially when the udder is diseased, has been clearly demonstrated. Milk is dangerous even when the udder is not specially diseased. It will communicate the disease even when diluted by mixing with large quantities of other milk in the creamery or cheese factory; whey is equally dangerous.

The germs remain active in the skim-milk and whey, and may produce the disease in calves fed on it. Milk obtained from creameries in districts where tuberculosis prevails should be raised in temperature for 10 minutes to 160 degrees before being given to calves, otherwise living bacilli may be taken into the stomach, and, entering the lymph channels, produce the disease. As a precautionary measure, milk from tuberculous cows should not be received at creameries or cheese factories. All skim milk and whey should be heated to 160 degrees for 10 minutes before being given out to farmers from the factories for feeding calves or swine. Unless this is done, creameries and cheese factories may become distributing agents of this disease to healthy herds. Milk from tuberculous cows is a frequent source of communicating the disease from cattle to people, especially children and old feeble persons; meat from diseased cattle is also dangerous, although it may be sterilised by heat.

HOW TO PREVENT ITS INTRODUCTION TO A HERD.

See that your animals to begin with are free from the disease.

Never bring any animal into the byre till you have ascertained beyond a doubt that it is healthy.

Keep your own bull. Your neighbour may be obliging, but if careless about the health of his stock you may suffer irreparable injury by accepting even the free use of his bull should the animal happen to be tuberculous.

Conversely, if you have a bull, be exceedingly careful to see that no tuberculous cows are brought to him for service.

Never allow a consumptive person to have anything to do with your cattle; make no mistake about this.

Your byres must be well lighted—almost as light as outdoors; disease germs are killed by sunlight.

Pure air and plenty of it is essential to health. This can only be provided by sufficient space. Let your cow stable be roomy.

Drainage is essential to purity of the air. Without proper and efficient drainage, the air must become contaminated by emanations from the droppings and urine of the cattle, as well as by the decomposing vegetable matters with which they are mixed.

Drain your buildings, and do it thoroughly.

The ventilation is all-important. By properly arranged ventilators the impure air is removed and replaced by pure, the oxygen of the air is constantly being consumed in the process of breathing, and unless it is replaced it becomes unfit to sustain animal life. The constant change of the air in buildings inhabited by animals is absolutely necessary to preserve health.

During summer weather most buildings are sufficiently ventilated by the doors and windows being left open; it is during the winter when cattle are housed that they suffer from imperfect ventilation.

Proper ventilation provides for the admission of the pure and the escape of the foul air. As a rule farmers' architects do not make sufficient provision for either.

The air may be admitted by openings near the floor, and by windows hinged at the bottom and dropping inward.

The ventilators or air shafts are usually too small. Most buildings require shafts 3 feet square and placed about 20 feet apart, in the middle aisle of the byre. The shafts should be divided inside into two by a partition extending from the top to within 3 feet of the ceiling; the opening being controlled by trapdoors opened or closed by cords running through pulleys.

CATTLE STANDING HEAD TO HEAD OBJECTIONABLE.

The common plan of arranging the byre, so as to save labour in feeding, by having an alley-way with the heads of the cattle opposite each other, is objectionable from a health standpoint, as it exposes animals opposite tuberculous cattle much more to the contagion than when they are placed with their heads to the wall. They may be easier fed the former way, but they are easier cleaned the latter, and it has a decided sanitary advantage should contagious disease exist.

Running water in troughs placed in front of cattle is objectionable if tuberculosis is present, as by this means the germs may be carried in front of the whole herd.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOSIS.

In the majority of cases the symptoms are obscure, and till the discovery by Professor Koch of the reaction produced by the injection of tuberculin (being a most reliable test for discovering this disease in obscure cases unrecognisable by symptoms) the majority of cases could not be detected even by experts.

When affecting the lungs, throat, and respiratory organs generally, it is accompanied by a frequent cough, but no fever. There is disturbance of respiration: the breathing is quickened by slight exertion or excitement; the cough is produced by changes of temperature. The expert can detect dull spots surrounded by areas of increased resonance on examination of the lungs by the usual method.

Usually the superficial glands, in the throat between the jaws, under the ear, or the udder, may be hard and swollen. The animals may continue for months or even years to maintain fair condition. They are sometimes fat while the lungs may be found studded by large tubercular masses.

When the disease is abdominal and the glands and organs in the belly are chiefly affected, the symptoms of defective nutrition are early apparent: emaciation, lessened secretion of milk, indigestion, breathlessness, and general failure more or less rapid. Many cases cannot be detected by symptoms, but can be almost to a certainty (in 98 per cent. at least) by the tuberculin test.

THE TUBERCULIN TEST.

Until the discovery by Professor Koch, in his experiments to discover a cure for consumption in human beings, that the injection of tuberculin invariably caused a rise in temperature when the person or animal was tuberculous, while it produced no effect whatever when free from it, the detection of the disease in early stages, or when slightly affected, was considered impossible in most cases. This test is most delicate and reliable (about 98 per cent.), where it is properly applied.

Tuberculin is a soluble product of cultures of tubercle bacilli, of which a glycerine extract is made which is sterilised by heat and filtered through porcelain, so that it contains no living germs, and therefore cannot produce tuberculosis in animals injected with it. It has, therefore, no effect on healthy animals; in some cases the disease is aggravated by it when it exists, but it cannot be produced by it. The lymph must not be exposed to sunlight. It must not be frozen; must be kept well corked to exclude air.

Tuberculin Injection has no Bad Effects on the Secretion of Milk.—The consensus of opinion of those most experienced is that it does not lessen the secretion of milk in dairy cattle; consequently they may be tested even when in full milk without disturbing its secretion.

OFTEN NO REACTION IN ADVANCED CASES.

It is usually found that in animals in advanced stages of the disease, owing to there being a superabundance of tuberculin in the system already, there is little or no reaction.

Fortunately in such cases the symptoms are so apparent, such as coughing, wasting, enlarged glands, &c., that the owner has little difficulty in recognising the same.

HOW TO DEAL WITH A DISEASED HERD.

When tuberculosis is discovered in a herd, immediately remove the diseased ones from the healthy to another isolated stable, or a part of the byre may be partitioned off by close boards as far as possible from the rest of the herd.

In the case of low-priced cattle the owner will best serve his own interests by slaughtering them at once.

When they are specially valuable and in calf, the experiments of Professor Bang and others show that the calf may be saved by removing it as soon as born, and before the cow has licked it, or it has been suckled by its diseased mother; and by placing it in an uninfected building, and feeding it on milk from tested cows, it will in all probability grow up free from tuberculosis, although, as previously explained, it may have a predisposition to contract the disease.

The herd should be tested every six months, and those which react likewise removed, till all trace of it disappears.

General Notes.

INDIAN SUGAR AND COUNTERVAILING DUTIES.

ON this subject, the *London Produce Markets Review* says:—It (*i.e.*, the imposition of the duty) would do no good to Indian producers. Its sole effect would be to raise the price of German granulated to the Indian consumer to the extent of 1s. 3d. to 1s. 6d. per cwt. It is doubtful whether this would do any good, even to Mauritius, which is suffering really because its sugar, though always fine in quality, and now better made, has till recently been poorly prepared, according to modern ideas, in large crystals of a greyish yellow, while granulated is small and snow white. As regards the Indian producer, to the best of our belief there is not at present a single modern sugar factory where good crystals are made direct from the cane. There are, we believe, a few refineries where crystals are made from raw sugar, but secondary and inferior processes cannot compete with German granulated. It is by no means probable, therefore, that the proposed countervailing duties will shut German sugar out of India. On the other hand, the effect will no doubt be to encourage, to however small extent, the continuance in India itself of the present terribly inefficient methods of manufacture. Literally, millions—probably over 3,000,000—of tons sugar are made in the Indian Empire every year, in the form of goor, jaggery, and the like, which are more like mud than sugar. India is believed to be the native home of the sugar-cane, and within its vast limits, and with the great varieties of climate which the peninsula possesses, the cane is said to ripen all the year round. Labour is cheaper than in any other part of the world, machinery and European supervision are easily obtained, and in Bengal there is plenty of coal. Instead of taking alarm at trifling European imports, which have only to some extent taken the place of what have been received from Mauritius for years, the Indian Government would do better to set up a few model sugar factories to show what can be done on European methods in India itself. German granulated fetches quite double the price of native sugar, and a tax of, say, 1 rupee per cwt. cannot affect it much. It is surely more important to try and get a better price at home by improving the 3,000,000 tons produced than to vainly attempt to shut out the paltry quantity of some 60,000 or even 100,000 tons of German granulated, and at the same time confuse and very probably endanger the international trade of the whole British Empire. The quarrelling and ill-feeling between Germany and the United States, of which we have not yet seen the end, are due to this countervailing idea, and it is the more inopportune

to introduce it when Germany is sincerely desirous of putting an end to the bounties. The great European offender in this respect is France, and her sugar does not go to India, because what she makes is unsuitable. The Indian Government could probably stop the use of granulated to-morrow by simply having the fact circulated among the priests and Brahmins that it was refined with animal charcoal, probably containing the bones of the sacred animal, the cow, and very probably those of the unclean animal, the pig, as well. No orthodox Hindoo would touch it if he knew this. Not that it would be desirable to pander to such superstition, but from an economical point of view it would be less objectionable than countervailing duties.

The "anti-bounty" mind has been naturally much exercised over the Indian question. Relatively trivial imports (such as we have named) are treated as threatening the destruction of the Indian industry, and dismal predictions are made of the extinction of large portions of the land revenue, on which the Government lives, and of the abandonment of large quantities of irrigated land, to the great loss of the taxpayer, who has erected the canals. The irrigated area in 1896-7 under food crops was 27,500,000 acres. Of this, 25,500,000 was under cereals, and 2,000,000 under other food crops, sugar not being separately stated in the statistical abstract, but not likely to amount to any large total, as the cultivation is spread over the whole Empire, of which the irrigated land forms a small proportion. The whole outcry purports to be based upon the fact that the Indian sugar area fell off $8\frac{1}{2}$ per cent. in 1896-97; but surely the famine fully accounts for this, other foods being more profitable. The cat is let out of the bag by the assertion that Indian refined sugar, which used to sell at 11 to 16 rupees per maund (25 lb.), could not compete with German beet at 8 rupees per maund—in fact, what the Indian sugar refiners want is sugar protection, in order to raise the price they get 30 to 100 per cent. It is understood that for many years, and till quite recently, sugar-cane was the most lucrative of all the Indian crops. In the bad sugar year (1896-97) the Indian area under sugar was below 20,000 acres less than in 1893-94, the only other year we have the figures for, so that, if it fell off $8\frac{1}{2}$ per cent. as alleged, there must have been a great increase in 1894, 1895, and 1896. The Ryots, however, cannot escape the effects of the great depreciation in values all over the world, and this may lead to some redistribution of crops. But, if so, the land tax being on the cultivated area we cannot see where the Indian revenue would lose. Sugar land, indeed, sometimes has a special rate levied, but otherwise it pays the rate of ordinary "wet crops." The substitution of one wet crop for another could not have much effect over a term of years. It is possible that the Indian land revenue might decrease if the Ryots on the whole found their total earnings from land under all crops fall off so much that the land tax had to be reassessed on a lower scale. This, however, if it ultimately took place, would be an effect of a general movement in the price of agricultural produce, and could not be affected by the substitution of one crop for another. At the present moment jaggery sugar is fetching 30 to 40 per cent. more in this market than it did a few years back, and this does not look like the annihilation of the Indian sugar trade, with its cultivated area of nearly 2,789,000 acres in the unfavourable year, 1896-97. It must be remembered that the position in the East Indies is totally different to that of our West Indian Islands. India is a producing and consuming country, and only at intervals an exporter, while most of her supplies of fine sugar have for years been imported, owing to the inferior Indian methods of manufacture. It is to be remembered, too, that, as the economical condition of the Indian peoples improves, as we are glad to believe it does, they will, like ourselves, call for better sugar than the sticky black substitutes as yet supplied to them. If so, the crystals must be imported, as they are not locally produced. Low sea freights and railways in India have no doubt enabled foreign sugar to penetrate more deeply into the Empire, and the local Government seems to have taken fright at what is a purely economical change, having nothing or next to nothing to do with bounties. It would have been better to take steps to put up model sugar factories in India itself, to

teach the natives and Europeans also the vast field for profitable industry before them, than to attempt to perpetuate, by a paltry protection, the present miserable state of things. Other countries which can and do grow cane-sugar have of late years made or will shortly make (in the Philippines, for example), great strides in the improvement of their produce, and we fear that unless India puts her shoulder to the wheel, that the decay of her sugar industry will become still more apparent, while the imposition of countervailing duties will only tend to promote a sense of false security, postponing thereby the improvements in manufacture which are the basis of eventual success in the keen competition of the present day. The fact that America imposes countervailing duties on bounty-fed sugar to protect her own sugar industry, does not prevent her being a large buyer of beet sugar. The impending "destruction" of the Indian sugar industry appears to be a very sudden thing, for only two years ago the imports from the Continent fell off immensely when sugar was temporarily dearer. If India, with a costly freight and enormous inland railway distances, cannot compete with a fall of 1s. or so in German granulated, the "native home of the cane" must indeed be in a bad manufacturing way. The following are the figures of the Continental sugar imports to India:—1894-95, 46,026; 1895-96, 14,400; 1896-97, 60,536; 1897-98, 107,383.

SHEEP DRESSING.

BEST METHODS OF BUTCHERING AND DRESSING SHEEP DESCRIBED.

STICKING in large slaughter-houses is usually performed while the sheep or lamb hangs suspended by its hind leg or legs, and is being carried rapidly along a track or chain moved by machinery, this branch of the business being allotted to one or more men, who despatch an enormous number in a day. As this article is intended to instruct those contemplating killing their own home-raised sheep and lambs, a local method of dressing will no doubt prove more readable and interesting to the average reader.

A sheep is laid on its left side with its head over the drain or blood gutter; it is then stuck by plunging the knife clear through the neck, close behind the ear, and cutting off both veins of the neck. Some slaughter-men sever both the windpipe and "meat-gut," but, myself, I consider it the cleaner method to leave both these intact. Now, if the left hand is placed under the lower jaw of the animal, and the right on top of its head, its neck may be easily broken, at the first joint, next the head; pulling up with the left hand and pressing down with the right is just how it is done.

The neck being broken, by inserting the finger in the hole made by the sticking-knife, the spinal "marrow" or cord can be severed, and all fear of the animal crying or ever regaining its feet is at an end. Now take another animal, and lay it on its left side as in the former case, but push its under front and hind legs under the dead one, and so on to any number desired; this method insures each animal holding another in position for sticking.

Legging is next in order of procedure. Lay the dead animal on its back; place its near front leg between your knees, and then take between the first finger and thumb of your left hand the skin of the front part of the shank of the leg; then with an upward pull of the skin, and an upward cut of the knife, the front part of the shank is skinned, and at the same time an opening is made for receiving the knife in opening the shank in an almost direct line to the mouth. By keeping the knife a little slanting while opening the skin, the chances of cutting into the flesh are minimised.

After opening the skin from the shank to the head, commence to skin with the blade of the knife, being careful not to cut either the flesh or the skin; after loosening the skin a little along the edge of the opening, you will find that the handle of the knife is the best to skin with. The main art in skinning is not to use the blade of the knife more than you can possibly help. Sometimes you can pound off the skin with your fist at an astonishing speed; especially is this true in regard to "ripe" (fat) animals; but it must be borne in mind that it is

indispensable to use the blade of the knife on certain portions of the carcass in removing the skin. Experience will soon teach where and where not to use the knife in skinning. Treat the "off" leg in about the same manner as recommended with the "near" one, only that the skin should be opened to about a point middle of the neck. The breast may now be skinned by putting your foot on the sheep's stomach, and taking the loose breast skin with both hands and giving it a vigorous pull, being careful to see that you do not tear the flesh.

The next thing to be done is to "wizzle" the subject under treatment, meaning to prepare the "meat-gut," so as to pull it out with the stomach, &c. Cut a straight line from the breast to thorax; under the windpipe you will find the "meat-gut"; by cutting around it carefully—not through—you will find a white-looking pipe concealed underneath the somewhat brownish-looking "meat-gut"; if you cut around gut until you see the whole of the white pipe you can tie the gut in a knot, after severing the same; this prevents contents of stomach from coming out during dressing operations. A gentle pull at this "meat-gut" will greatly enhance ease in the removal of stomach later on.

The hind legs must now be "legged." Open skin at a little above gambrel joint to about an inch from vent. Take the "near" leg first, then the "off" one. Try the handle of the knife in skinning, but if you find the flesh tears off you must have recourse to the blade. Skin udder or scrotum, as the case may be, by pulling skin back; in wethers drive the handle of knife into scrotum to remove fat from skin. Loosen vent; pull out and cut off about a foot of gut. Now hang your sheep up, not by a rough wooden gambrel thrust through the gambrel joint, but by a neat little "double-ended" hook or gambrel inserted into the strings at a little above the foot, or, if you loosen the cords of legs with your knife, string or twine will answer the purpose all right. Now open skin down the centre of belly; after which take the loose skin at the breast, and, with a pull upward and at the same time backward toward the back, you may somewhat easily skin one-half the belly, &c. You must be careful that everything is freed before pulling too hard, or you may pull off considerable flesh with the skin, and somewhat mar the appearance of your subject under treatment. Skin the inside of the hind legs with blade of knife, after pulling skin down from outside of leg. To take the skin from side and back is now very easy, nothing but fist being required to pound it off. After you have skin off, wipe with damp cloth; scrape veins of back with knife from centre of back toward front of carcass. Stick your knife into main veins in breast or neck; this will let out accumulated blood. You may now open breast by inserting knife into point of breast, and with an upward pull the bones will divide. Now open your subject by dividing udder, or, if animal be a wether, scrotum fat, and then cutting open belly from this point, being careful to keep your hand inside to prevent cutting entrails; or you may commence at a point where you left off cutting breast bones. The next and a very important thing is the taking off the caul.

First take it carefully off from the left side of the belly and entrails; then throw the entrails over your left hand—now holding the caul—and you can easily remove the remainder from entrails and fourth stomach. The kidneys must be pulled through holes made in the caul, and fixed with skewers.

Spring lambs are usually dressed with the skins left on their backs. Heavy sheep are usually dressed hog style, their sides and backs being decorated by flowers, &c., the handiwork of the butcher with his knife.—SHEPHERD BOY, in *Wool and Cotton Reporter*.

HINTS FOR DAIRYMEN.

THERE are four items which every owner of cows should constantly remember. The first is to keep a record of the milk production of each cow for a year (if he can record the butter yield and cost of food for each, so much the better). The second point is to prevent the production of horns on his young cattle by removing the hair around the "bosses" where the horns would be produced,

then damp lightly with water, and rub only on the bosses with lunar caustic until the skin appears inflamed—about two or three minutes. The third point is to remember that a tablespoonful of carbonate of soda in a winebottle of water, if administered to an animal which has eaten grain, lucerne, clover, or other food causing it to be “blown” (otherwise called “tympanitis,” or “hoven,” or “blast”) will at once remedy the evil. Lastly, when a cow is attacked with “milk fever” after calving, the best remedy is to give her at intervals of three hours two doses of brandy and water—about half-a-bottle at each time—and keep the bowels open.—*South Australian Journal of Agriculture.*

THE VALUE OF POULTRY.

MANY a time it has been asserted by farmers, after a dry season, that the cows and fowls gave the best returns from the farm, and that the labour of the wife and daughters in tending these sources of revenue had defrayed all the household expenses. But there is a further profit or advantage connected with poultry which is almost always overlooked. Ducks, turkeys, hens, and guinea fowls are indefatigable in destroying grubs, beetles, caterpillars, worms, and all sorts of farm and garden pests. They will even eat mice, young snakes, and other small vermin. The turkeys eat enormous quantities of insects, and the number eaten by other varieties of poultry would surprise anyone who takes the trouble to inquire into the matter.—*South Australian Journal of Agriculture.*

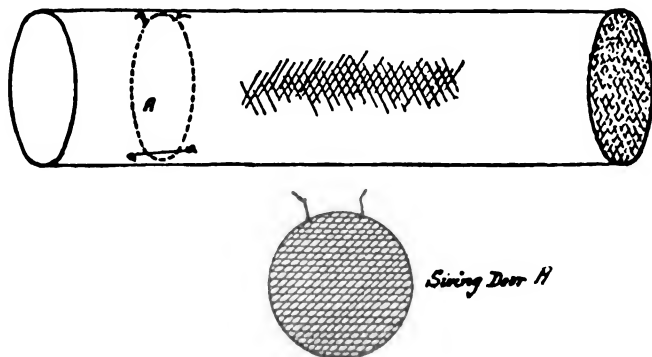
A MARKET FOR QUEENSLAND PRODUCE.

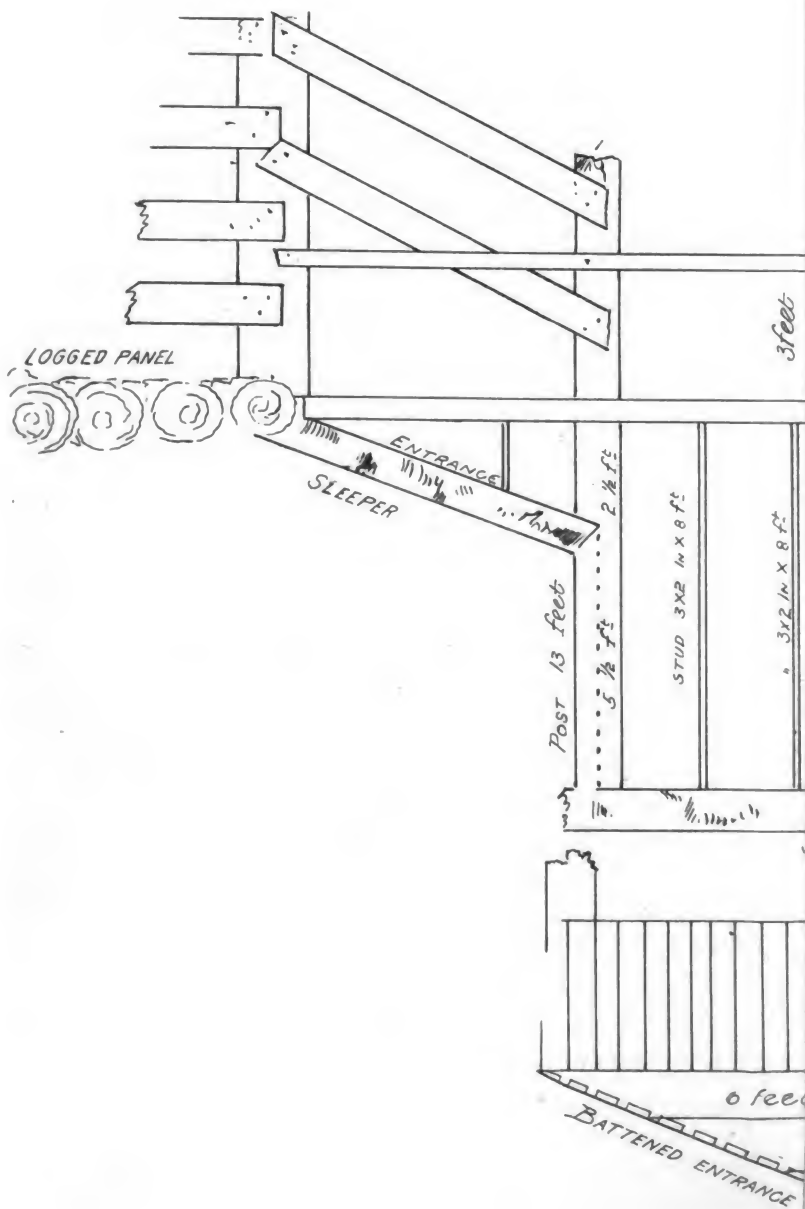
As this colony progresses, and its flocks and herds increase, the sphere of action in connection with outside markets will necessarily have to be extended. From the following note in the *Australasian Pastoralists' Review*, it would appear that China may in the near future prove a good market for our dairy produce:—

From California, where an extraordinary development of the dairy industry is taking place, exports of cheese to China have increased over 200 per cent. in the last three years, and the shipment of butter this year will also show a large expansion. Alluding to trade with Asia generally, Senator Briss recently said:—“We need a market for our surplus production. The place to find it is on the Pacific, where 400,000,000 people are awaiting civilisation. We are going to ship our products to China, and find a distributing agent for them in that vast empire over an American railroad.”

A NOVEL AND CHEAP RABBIT-TRAP.

MR. J. SEARS, a member of Foster Branch of the Agricultural Bureau, sends to the *South Australian Journal of Agriculture* a model of a cylindrical rabbit-trap, of which the following is an illustration:—





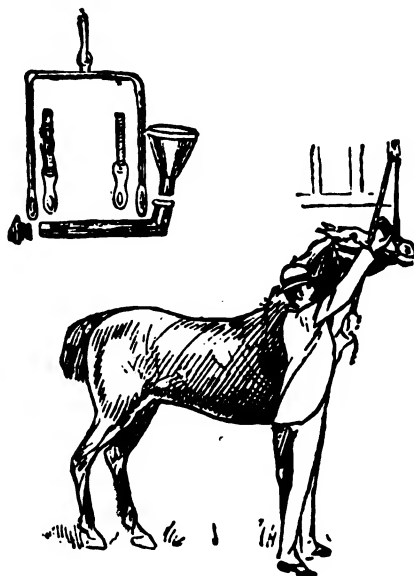
Mr. Sears states that it is usual to take two or three rabbits from each trap, and he has taken five from a single trap. He suggests that it would be possible to send rabbits alive to Adelaide, and thus ensure that they arrive in a fresh and sweet condition, which cannot always be the case where the animals are taken with steel traps and are killed before being sent to the freezing works or to market.

vicious in the way of attacking a man," says the *Farmers' Advocate*, "it is not safe to lead him even with a staff, for he may quickly snap the staff with his horn or jerk it from the hand of the attendant. Dehorning, while it mitigates the danger to some extent, is not a sure cure, as many bulls are just as vicious after the wounds heal, and the operation disfigures a handsome bull. It is not necessary to put him away for his fault, however, if he is a valuable animal and a good breeder (and it is generally the lively fellows that get good stock and transmit force and energy to their progeny), as he may be easily controlled by being blindfolded by the use of a leather helmet formed to cover the forehead and eyes, secured firmly around the horns, and by a strong throat latch made to buckle under the cheeks. The eyes may be protected by conical-shaped leather goggles, which are firmly fastened in the helmet. The helmet is a complete blinder, and the bull wearing it is subject to his master's hand, and may be led quietly wherever desired. The same appliance may be used with complete success in the case of a cow becoming excited and hard to manage when being led or shipped."

THE DRENCHING BIT.

The Top Illustration shows the Arrangement for Taking Bit to Pieces for Cleaning Purposes.

It is thoroughly well made, the rope and head-strap being stout and reliable, and all metal parts are heavily nickel-plated or tinned, rusting thus being prevented. It is, indeed, very useful, and is a necessary article in every stable. It can be taken to pieces in a few seconds, and by unscrewing the nut and drawing out the tube can be cleaned.



The Medicine Drenching Bit introduced by Messrs. Arnold and Sons, the well-known makers of veterinary instruments, is well worth mention in this column. Among its numerous advantages may be mentioned the following:—

1. Administering medicine to a horse or cow in a liquid form.
2. Administering gradually and regularly, without waste.
3. Administering stimulants preparatory to going out.
4. Stimulating and disinfecting throat and lungs.
5. Washing out the mouth when diseased or otherwise.

A NEW FOOD FOR STOCK.

In both Denmark and Sweden, for the past few years, experiments have been made with blood as an ingredient for animal feed. Similar experiments have been made in Germany with apparent success. A patent has been issued for the manufacture of an animal-food mixture called "**Kraftfutter**" (strength feed) or "**Blutmelassefutter**" (blood molasses feed), of which the principal ingredients are fresh blood (collected at the city slaughter-houses), sugar refuse, and "grain cheat," by which is meant screenings or blowings from wheat, barley, rye, oats, &c. Turf mull, or turf flour, has been tested as a substitute for "cheat," but not with success.

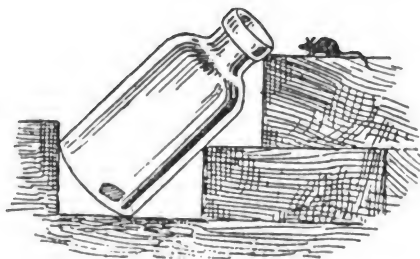
This feed is prepared in three different mixtures—for horses, for cattle and swine, and for poultry. The retail price is 6 marks (about 6s.) per 100 lb. The preparation is not intended to be fed raw, but as a mixture with other regular feed—for instance, when the amount of oats given per day is 15 lb., with the use of "**Kraftfutter**" the quantity of oats is reduced to half, or 7½ lb., to which is added 5 lb. of "**Kraftfutter**."

At present the United States Government is experimenting with this feed on artillery horses, it being claimed that the albumen in blood, coupled with sugar and the other ingredients, makes an exceptionally strengthening food, in addition to being inexpensive.

Factories for the production of this mixture are now in operation at Berlin, Stettin, Kiel, and Königsberg.

A BOTTLE MOUSE-TRAP.

MICE are easily caught if one goes the *right* way about effecting their extermination. A cat is useful in this work, but she cannot eat more than her fill; a dog is too active to watch and wait like his feline companion; traps want constant attention, and, moreover, they become recognised by the wiler members of these pestiferous vermin; and poison is dangerous, besides which mice destroyed in this way often die in the runs, and so give rise to offensive odours. Bottles will catch mice alive or dead, as may be required. They should be vessels with fairly open mouths and not too long necks, and when in position should be placed at an angle, as in the accompanying diagram, with means of



approach. If something is inserted as a bait, with a scent sufficient to attract the attention of the little animals, they will soon investigate the inner recesses of the bottle, and, once there, their exit is more than they can effect themselves. The glass affords no foothold, and, though they may spring as far as the bottle neck, down they slide, to repeat the effort until exhaustion compels them to desist. If a poisoned bait is put in the bottle, the traps should be constantly visited, and the bodies of the victims emptied out. Barns, corn lofts, stacks, and other places about the farm can be cleared pretty effectually of rats and mice by this means, only in the case of rats the bait should always be poisoned.

A GOOD MANURE FOR ROSES.

ROSES may be much benefited by a manurial dressing once in three weeks of 1 lb. of nitrate of soda to from 50 to 75 gallons of water. After application moisten the soil slightly. Old stocks require more dilution—say, 100 gallons of water to 1 lb. of nitrate. The soil may be soaked with this.

TO DETECT ADULTERATION OF SULPHATE OF COPPER.

A FARMER'S TEST.

MR. S. A. WOODHEAD, B.Sc., Lecturer on Chemistry at the Agricultural College, Uckfield, has devised a simple test for detecting adulteration of sulphate of copper. It requires no scientific knowledge to apply it, and the ordinary breakfast table supplies the necessary apparatus. Every year the use of sulphate of copper on the farm rapidly increases. Every farmer uses it to dress his seed-corn, to prevent smut and bunt. The practice of spraying potatoes to prevent potato disease is fast extending, and the success attending the spraying of crops, to destroy charlock, leads to the reasonable expectation that there will be large quantities used for this purpose. As sulphate of iron costs only about one-eighth of sulphate of copper, and as its substitution in part or altogether is a common fraud, it is very important that the farmer should have a ready means for detecting the fraud. The purchaser is not only defrauded in price, but the results he may look for on his crops are not realised.

After the demonstration of charlock-destroying at the Agricultural College Farm, Uckfield, Mr. Strawson suggested to Mr. Woodhead the desirability of some simple test, and together they arrived at the one described below. Iron salts and tannin are employed in the manufacture of ink; tea supplies tannin. If a solution of tea be poured on a solution of sulphate of iron, the tea takes a black colour, and a flocculent precipitate quickly forms. When, however, the solution of sulphate of iron is substituted by sulphate of copper, the change is but little, and tends to a brown or dirty olive-green, which cannot be confounded with that from the iron salt. The test, therefore, can be done at the tea table.

If a rather more accurate method of doing it is desired, make a solution of tea—one teaspoonful in half-a-pint of boiling water. Make another of one teaspoonful of the sulphate in half-a-pint of water. Then pour some clear water into a tumbler, and put in a teaspoonful of both the solutions. If there is iron in it, a black tinge will pervade the mixture. If it only becomes browner, or becomes a dirty olive-green, there is no iron present. If a comparative test is desired, make also a solution of known pure sulphate of copper—one teaspoonful to half-a-pint of water. Take two tumblers, set them on a sheet of white paper side by side, partly fill with clear water, add tea until both are exactly the same colour. Then in one put the doubtful solution, and in the other the copper solution. The comparison is then very easy. If there is 5 per cent. of iron in the doubtful solution, it will look like watered ink; but as little as 2 per cent., or even less, can easily be detected. With so simple and inexpensive a test, no farmer need suffer from the fraud he is now very liable to.—*Mark Lane Express*.

PRESERVING EGGS.

THE following two recipes came from Germany and France respectively. The *Pharmaceutische Zeitung* gives one by Professor Dietrich, who says:—

Take 25 parts of sodium silicate with 75 parts of water. The water is to be first boiled and then cooled before using. Well water is recommended. The white of eggs so preserved will, he says, beat into a good froth after having been stored for six months.

The next recipe is that of Mr. Eudler, who (says the *Revue de Chimie Industrielle* of March, 1899) has obtained a patent for his process in France:—

Burn some vegetable fibres (turf) and some wood fibres partially, so as to obtain ashes perfectly free from resinous cinders. The best method is electric combustion, so that the mixture may not contain the least particle of carbon.

Then boil some pure water, having previously added, according to the quantity, from 5 to 7 per 1,000 parts of rock salt. Allow this to cool.

Then add to the solution from 8 to 20 parts of borax. This neutralises the salty taste. It is the same in the case of the vegetable fibre sashes.

Now arrange the eggs in layers, sprinkling them with these ashes—casks are suitable receptacles, kept in an open place, dry, cool, and free from odour. Pour the liquid on the eggs so as to cover them, and shut the receptacles down without fastening them. To give the eggs a fine polish, coat them lightly with vaseline, paraffin, &c., before sending them away.

Yet another idea comes from England, and the *Agricultural Gazette* gives it thus:—

The eggs are placed in jars containing lime water, or in some liquid compound, or rubbed in grease, or simply packed in dry salt, or bran or sharps. The last method—packing in sharps—is least trouble, and having found it quite dependable, this is the process I always follow. All that is necessary is to keep air absolutely from the eggs, and thus arrest decomposition. In the first place, only fresh eggs must be used. When the egg basket and its contents are brought into the house, the preserving should begin right away, as the Americans say. The ordinary biscuit tin makes a capital receptacle for the eggs, the 7-lb. size for choice. They can generally be obtained, if the housekeeper has none to spare, from a grocer's shop for a trifling amount. Use coarse sharps, thirds, or pollard, the name varies in different localities, fresh, sweet; pack carefully; be sure no two eggs touch each other or the sides or bottom of the box or tin; about 4 dozen eggs will go to a 7-lb. biscuit tin. Pat the sides gently to fill all crevices, and be sure when the top row is covered that the tin is as full as it will hold; a single sheet of brown paper should be laid on top before the lid goes on. See that this fits securely, and tie it down; or, better still, put a wrapping of brown paper over the tin and sealing-wax the ends in addition to tying. The eggs will now keep for months and be fit for boiling as well as cooking. Stow away in a dry cupboard, and give an occasional turn to prevent the yolk sticking to the shell. The ends, I should say, are to be packed standing upright. This method is cleaner than greasing, and there is no fear of any extraneous flavour clinging to the egg, as often occurs to those preserved in lime water or some liquid compound. One should be careful not to crack any shells when packing, but if fowls are well supplied with oyster shells or similar material, the eggs will stand a good deal of pressing and packing.

COMPRESSED COFFEE.

The Engineer of 16th June says:—A process has been invented and patented in Brazil for preparing coffee in tabloids by a system of compression. It is argued that not only will there be less expense in exporting coffee in this form, but that the consumer will be more certain of thus receiving for his use the pure unadulterated article.

TO STOP A RUNAWAY HORSE.

SCARCELY a week passes in any year that human lives are not jeopardised by horses taking fright and running away. The man who can devise some means which will surely prevent this will be a great public benefactor. Some one who professes to know states that runaway accidents seldom occur in Russia.

It is asserted that in Russia a horse that is addicted to the habit of running away has a thin cord with a running noose around his neck at the neck strap, and the end is tied to the dashboard.

A traveller says:—I saw in the Corso a phaeton with two spirited horses bolt. They were driven by a lady, and I expected to see instant destruction. But the lady coolly grasped a thin cord, and within 30 yards the horses came to a full stop. I afterwards met the lady, and expressed surprise at the skill with which she stopped the runaways.

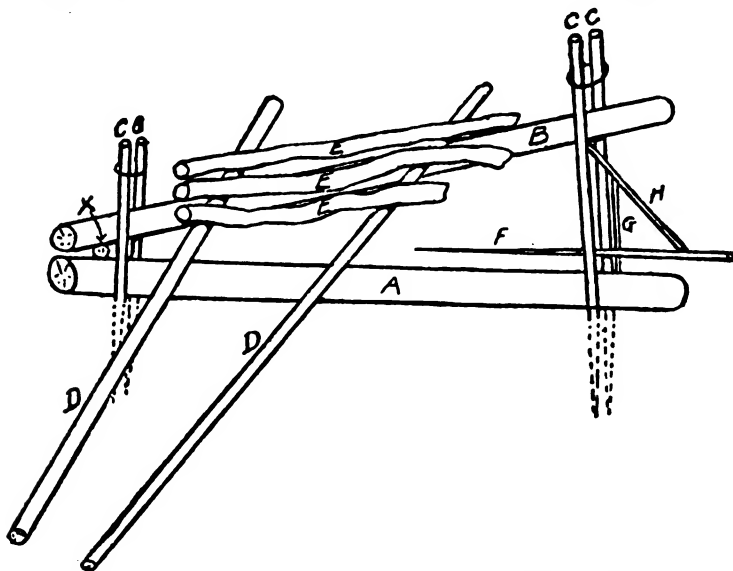
She treated it as a trifle, and told me accidents from runaway horses are unknown in Russia, as no one but a lunatic would drive without the cord. When a horse bolts he always takes the bit in his teeth, and the skill of the driver is useless. The moment the pressure comes on the windpipe the horse knows he has met his master.

A CURE FOR WARTS.

Try this remedy for warts: Saturate the warts every few days with pure castor oil and they will disappear, leaving the surface as smooth as though they were never there. We have known of several cases where warts were removed from the nose of colts by simply rubbing them with lard occasionally.

THE RUSSIAN WOLF-TRAP.

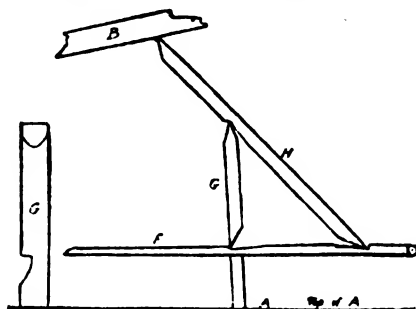
From the *Agricultural Journal* of the Cape of Good Hope we take the following suggestion for a trap which would seem to be adopted for catching wallabies. The illustration will show the mode of its construction and operation:—



The following further particulars are from the *Adelaide Observer*, the traps being recommended for catching foxes:—

In constructing the trap the bed piece marked A is laid firmly on the ground. Then proceed to place the four stakes that must be pointed to drive into the ground to keep the fall piece marked B in position. Lay B on A with a piece of timber the size of the wrist, as shown at X (Fig. 1). Then secure the tops of the stakes, C C C C, with pieces of hay-tie, or any string or wire that has no smell about it. Then proceed to lay on the two bearers, D D, to hold the loading marked E E E, provide the loading, and you are prepared to set the trap.

The trigger is the next consideration. It is simple and easy to construct with a pocket-knife out of a branch the size of a whipstick, and with the bark on, as it is less conspicuous in that way. F G H is the trigger in three pieces. Determine the intended height of the trap between A and B at the position of



TRIGGER.

the trigger-post G, and let it—the post—be three-quarter the height. Let H be the strongest piece, as it has to bear the weight of all the loading. The piece F is the slightest, with the stoutest end to the right hand of the trap, as shown in Fig. 1. In preparing the trigger see sketch No. 2 enlarged, and mate the pieces in proportion as shown in sketch No. 1, and it will be evident that the slightest pressure on F is sufficient to disengage it at the catch 1 when the B, with its loading, collapses on to the intruder.

Sometimes the traps may be neglected for a time, and dead vermin lie in them till they decompose. In this case, do not reset the trap immediately, but put a prop under the fallpiece to keep it up, and bury the trigger pieces for a week to sweeten them, so that the vermin may accustom themselves to the track again. In placing the trap in position, it should be arranged so that the part F on the trigger comes in the centre of the track, or hole, in any fence, and the load-bearers, D D, should be so arranged as not to come in contact with any obstruction when they fall on the vermin, or the latter may make their escape. The loading can be made as heavy as circumstances seem to require.

As logs are rather scarce in some parts of the country, a flat-shaped boulder may be fixed up to give weight. The trigger, or acting portion of the trap, is on the principle of the old-fashioned figure of four trap, of which a correspondent writes, his grandfather always had a number about his garden to keep the mice down, and keep them down they did, for a pretty large flat stone was used for the purpose.

WEIGHT OF CATTLE.

To estimate the weight of cattle by measurement, measure the girth close behind the shoulder and the length from the forepart of the shoulder-blade along the back to the bone at the tail, which is in a vertical line with the buttock, both in feet. Multiply the square of the girth, expressed in feet, by five times the length, and divide the product by 21, the quotient is the weight, nearly, of the four quarters, in imperial stones of 14 lb. avoirdupois. When the cattle are very fat the four quarters will be about one-tenth more, while in very lean cattle they will be one-twentieth less than the weight obtained by the rule.

HOW TO KEEP BUTTER HARD WITHOUT ICE.

Is there anything so distressing during summer months to the neat housewife as oily butter? Nothing, unless it is flies, and these she can dispense with by care and patience. Oily butter makes any carefully prepared table disreputable in appearance, to say nothing of the unpalatable result. There are many who are inaccessible to ice-dealers; fewer still who enjoy the luxury of a private ice-house. How to have hard butter without ice is a problem all have not solved.

The remedy for soft butter is as economical as simple. Purchase an 8 or 10 inch common, unglazed flowerpot. Wash thoroughly in clear water, then let it stand for an hour submerged in as cold well-water as can be procured. When saturated, drain a few minutes by turning the pot upside down. Prepare your butter on a plate a few hours before meal-time. Fit a cork into the hole in bottom of the pot to exclude all hot air. Place the pot over the butter, and set on stone cellar floor. The result will be most satisfactory. If the butter is not as hard as when placed on ice, it will retain its form and be hard enough for enjoyable use.—*Pacific Rural Press*.

SEED-SOWING EXTRAORDINARY.

HERE is a wrinkle for those who believe in sowing grasses—English and otherwise—broadcast over their runs, and one that is said to have worked like a charm. The gentleman who first hit on the notion had a lot of tins with perforated bottoms, and filled with grass-seed, affixed to the necks of milkers and other quiet cattle. Of course these, whilst feeding, shook the seeds out, with the result that to-day, all over his run, English grasses are to be found in abundance.—*Exchange*.

HONEY VINEGAR.

Put in a cask $1\frac{1}{2}$ lb. of honey to each gallon of water; add vinous ferment or common yeast. Set in a warm place; two months and three weeks from first mixing clarify with isinglass or skimmed milk, and in two weeks it is ready for market.

RISE IN BROOM MILLET.

IN consequence of the broom-millet crops having failed in America for the past two years, fancy prices have been ruling in Sydney—£28 to £31 per ton. It has in the past gone down to £10 and up to £24, the average price being about £16 to £18 per ton. Some farms on the northern rivers have done well with it. It should be sown in the early spring. We understand the seed is combed out, and not threshed. Care should be taken to get the correct seed.

TO ESTIMATE THE HEIGHT TO WHICH A COLT WILL GROW.

A WRITER in an American sporting journal gives the following rule to estimate the height a colt will grow to:—Take a colt at any time between six weeks old and one year; stand him on a level surface, so that he will stand naturally, then measure the distance from the hair of the hoof to his knee-joint, and for every inch, or fraction thereof, he will be hands high when matured. If he measures 15 inches he will grow to be 15 hands high; if $15\frac{1}{2}$ inches he will be $15\frac{1}{2}$ hands high; and so on.

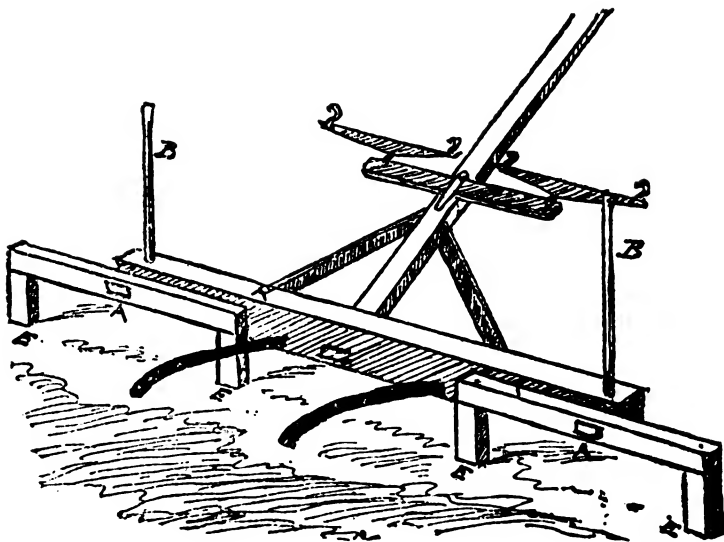
A USEFUL INVENTION.

MR. H. R. STEPHENS, Toowoomba, has sent us a sample of an ingenious instrument for measuring land, which he has designed for the use of farmers and other landholders who wish to ascertain the size of paddocks and plots. The little machine, which we illustrate in this issue, he calls the "Auto Wheel," or the "Auto Screw Measuring Wheel." It consists of a light wheel of a certain circumference in yards, which, as it is rolled along by means of the wooden handle attached, turns a screwed axle on which is a gauge-nut or pointer. As the wheel advances, this pointer moves along a brass gauge-plate (shown in the illustration), whereon figures are stamped equal to distances of from 10 yards up to 100 yards, on both sides of the plate. For measurements over 100 yards, all that has to be done is to turn the tool over and go ahead again. The weight of the machine is about 10 lb. It is quite under the manipulator's control, and may be used without exertion. As the construction is very simple, it can be manufactured at a low price. The machine has been tried at the Brisbane Botanic Gardens and by Captain E. C. Owen, Surveyor to the Geological Department, and it would appear that, for smooth ground, it amply fulfils the conditions claimed for it. It can be obtained from Messrs. H. G. Wyeth, Ruthven street, Toowoomba, or from Messrs. Smellie and Co., Brisbane.



A USEFUL CORN-MARKER.

A CORN-MARKER that will adapt itself to any uneven and stony surface may be made in the following manner:—A bed-piece (R), 5 inches square and 10 feet long, is provided. The marker holders (P P), $\frac{1}{2}$ feet long and 4 inches square, are attached to the bed-piece by wooden pins 2 inches thick (A A). The



markers (E E) are 10 inches long and 3 inches by 4 inches thick, and are fastened to the holders (P P) by 2-inch holes near the ends. The markers are bevelled at the bottom to facilitate their passage over obstructions and make a more distinct mark. At B B are upright sticks 3 feet long, by which the marker is guided in a straight line by the driver. At the ends of rows the marker is lifted round by the rear handles. Our sketch is taken from the *American Agriculturist*.

YIELD OF STRAWBERRIES.

WE have often been asked what should be the yield of an acre of strawberries. An acre of strawberries means from 10,000 to 16,000 plants, according to the distance apart at which they are planted. If each plant produces 1 lb. of fruit in the season, and this is certainly not a great crop for one plant, the total result will be over 7 tons to the acre. But suppose the plants to be planted at a distance of $2\frac{1}{2}$ feet between the rows and $1\frac{1}{2}$ feet between the plants, there would be 11,616 plants per acre, which would yield over 5 tons of fruit. Of course there are many circumstances which contribute to a decreased yield—drought, flood, heavy rains, disease, destruction of fruit by birds and noxious insects, &c.—so that, as a matter of fact, 2 tons per acre may be looked upon as a good crop. The great trouble of strawberry-growers is one which affects all growers of small fruits, such as coffee, native gooseberries, &c., and that is the question of labour. Great losses must occur where considerable areas are planted of a fruit which requires picking as it ripens, owing to the impossibility of obtaining a sufficient supply of temporary labour. When the population of the colony has increased to quadruple its present number, this difficulty will doubtless be overcome, but at present it cannot but militate against a very large extension of the strawberry-growing industry.

RUBBER IN BRITISH NEW GUINEA.

IN the discussion on Sir William MacGregor's paper before the Royal Colonial Institute, Mr. H. A. Wickham said:—

With regard to the resources of the Possession, I may mention that for thirty years I have had experience in tropical work, and I must state, even with so little time at my disposal, that, in my opinion, the most promising product likely to be of commercial value from New Guinea is indiarubber, particularly of the Para variety. In this I speak advisedly, because so far back as the seventies, under the initiative of Sir Joseph Hooker, I introduced this variety

for the Government of India with satisfactory results. In fact, nearly all tropical products are capable of being grown in the Possession of British New Guinea. In no tropical country with which I am acquainted have I seen so many varieties of sugar-cane, and so many indigenous varieties of banana. Tobacco of very fine quality is grown, and there is a native ginger superior to any grown even in the Western tropics. The cotton, also, is very fine, and there are some fibre plants of excellent quality. These things indicate the nature of the country and the climate, and its more promising prospective sources of revenue. Especially would I most strongly urge those in administration to offer every possible facility and inducement for the introduction of the *Hevea* (or Para) indiarubber, which could now be readily brought down by short passages through uniformly warm latitudes. A short time since, passing through the Straits Settlements, I saw trees in the second and third generations from my originals from the valley of the Amazon, looking thoroughly well and at home, and loaded with ripe seed. The *Castilloa* of Mexico and Honduras, and the *Ceara* and the *Ficus* rubbers would find suitable localities; but why use other than the best as now to be obtained?

THE BELGIAN RUBBER MARKET.

FROM the London *Times* we gather the following report on the condition of the rubber market at Antwerp on 16th June:—Since our report of 5th instant the rubber market has been fairly steady, and various small parcels, amounting together to 10 to 15 tons, have been taken off the market for consumption at about the prices fixed at the sale of 3rd June. The large users of rubbers, and notably those of the United States, have, however, largely held aloof, notwithstanding which prices have about held their ground, and the general tone of the market is at present, if anything, less depressed than at the beginning of the month. Yesterday another public sale took place, the chief offerings in which were about 245 tons of Congolese rubber, of which 136 tons were sold at still irregular, but on an average about unchanged, prices. Kassai still holds the lead, of course, fine red realising 10 f. 02½ c. down to 9 f. 85 c.; a parcel of about 20 tons of Upper Congo started at 8 f. 77½ c., and finished at 8 f. 47½ c. Other parcels went off slowly, and at about the same basis. The remaining 110 tons are now looking for bids at reasonable limits. The total stock here now amounts to about 210 tons, and advised as afloat there are 400 tons per steamers "Leopoldville" and "Goya." The Government returns of the country's foreign trade, issued a few days ago, give the following remarkable figures, which show how important Antwerp is rapidly becoming as a rubber market:—Imports of raw rubber during the five months, January-May, 1,839 tons, against 1,101 last year, and 834 in 1897. Of these 1,333 tons came from the Belgian Congo, 185 tons from Hamburg, 81 tons from France, and 74 tons from England, against, last year, 787, 76, 46, and 90 tons respectively. Exports of raw rubber in the same five months, 1,203 tons, against 660 last year and 468 in 1897. Of these the United States took 355, Hamburg 249, Holland 116, France 103, and England 92 tons, against, last year, 233, 63, 100, 99, and 43 tons respectively. Besides which it imported 498 tons of manufactured rubber, and exported or re-exported 280 tons of the same. Since writing the above, further 12½ tons have been sold, including Sierra Leone at 7 f. 15c., and Mongalla at 7 f. 85 c. per kilo.

TRANSPLANTING MINT.

No one who has a perch or two of vegetable garden should be without mint. It is one of the easiest herbs to propagate.

In transplanting mint, a morsel of stem, with a fragment of root or fibre attached, makes a fair plant, and, with a little moisture, will soon seize a strong hold of the soil. Space the plantlets about 1 foot from row to row, and 10 inches from each other; they will shoot up in the autumn, and there will be a slight gathering; but it is the spring pullings that are more valuable.

EXPORT AND IMPORT OF WHEAT—NEW SOUTH WALES.

IN the first six months of 1899, New South Wales shipped to Noumea, New Caledonia, 13,480 bags of wheat. The colony exported during that time 28,153 bags, and imported 125,215 bags.

KEI-APPLE SEED.

LAST June we printed an article (illustrated) on the Kei apple, or, as it is called in South Australia, the Kaffir apple (*Aberia*, *Kaffra*, or *Caffra*). It appears that the fruit is being so largely planted in that colony that no more seed is available at present. Some of the nurserymen (says *Garden and Field*, Adelaide) have plants, and quote 60s. per 100 for them. The same journal gives the following recipes for utilising the fruit. We can vouch for the excellence of the jam, having tasted that made by Mr. Herries, of Brisbane:—

Kei-apple Jelly.—Wipe the Kei apples, scald them to remove the skin, boil them up in as much water as will float them; when reduced to a pulp, strain off all the juice; to each pound of juice add 1½ lb. of sugar, as the fruit is very acid; boil till it jellies, when a few drops are put on a cold plate. This jelly is served with game and other meats, taking the place of currant jelly in English cookery.

Kei-apple jam is made similarly, but requires more sugar—say 1½ lb. sugar to 1 lb. fruit.

Ky-Ky sauce is made similar to tomato sauce, but leaving out the garlic. It is like the Queensland paw-paw apple sauce.

The name “Ky-Ky sauce” is one of Mr. Page’s own invention. He speaks from personal knowledge in recommending these recipes as being well worthy of trial. He says that the jam and jelly is equal to that made from Cape gooseberry, which is one of the most delicate and agreeable of all preserves.

Kei apples can also be cooked as other fruit, and is much like rhubarb, but requires more sugar.

Mr. James Page, who furnished the above recipes, also gives one for Cape gooseberry jam, which should prove of value to farmers on whose land the Cape or native gooseberry grows to perfection without cultivation:—Wash the berries and prick them; take equal weight of sugar and fruit; mix together, and let stand for 12 hours; then boil and keep stirring till it is a rich marmalade; no water required.

Anyone having Kei-apple seed to dispose of would do well to communicate with Mr. H. Sewell, Adelaide, South Australia.

LONDON MARKETS.

GINGER.—Inquiry for ginger is very limited at present. Bold and medium, roughly cut and scraped, limed, fetched 70s.; medium and small, roughly cut and scraped, limed, rather wormy, 37s. 6d.; small, wormy, 23s. 6d.; bold, brown, washed, rough Calicut, 33s. to 33s. 6d.; mouldy, brown, washed, rough Calicut, 30s. per cwt. Holders of Jamaica ginger had to suffer a heavy fall last May of from 4s. to 7s. per cwt. in order to sell. Prices ranged from 78s. for good, bold, washed to 58s. for ordinary dark. Green ginger brought 15s. per cwt. Towards the end of June, however, the long-continued depression gave way to a better tone, and prices for best sorts were considerably higher; fair to good, plump, bright, washed Jamaica selling at from 70s. to 77s.; and *Planting Opinion* for 15th July says:—Planters should give an eye to this product, as a considerable advance in prices may be looked forward to, amounting, in fact, to “a revolution in the market.”

RUBBER.—Market quiet. Fine hard Para brought 4s. 2½d. to 4s. 3d.; negroheads, scrappy, 3s. 5½d.; island, 2s. 10d. up to 16th June, when a fall of from 1s. to 2s. per cwt. was accepted on the greater part sold. Central American sold at the lowest prices on record.

COFFEE.—No material change in the market. A continued good demand for all coloury qualities, with an occasional advance for superior samples. Grey and inferior grades difficult of sale. The Brazilian crop of 1899-1900 will probably reach 3,000,000 bags. *Ceylon*: Plantation—Pea-berry, from 55s to 104s.; bold, 104s. to 108s.; smalls, 43s. 6d. to 47s. *Jamaica*: Ordinary greenish, 30s.; good to fine ordinary, 38s. to 44s. 6d.; middling blue, 60s.; pea-berry, 37s. to 59s. *Cuba*: Smalls, 34s. 6d.; middling, 61s.; bold, good, 80s. 6d.; pea-berry, 75s. The present visible supply of coffee is equal to nearly one-half the yearly production of the world, and will militate against any upward movement.

ANATTO SEED.—3½d. per lb. for good bright Madras.

CITRONELLA OIL.—11½d. per lb. (in drums).

VANILLA.—4 to 6 inch pods, 10s. 6d. per lb.; Seychelles, good, 7½ inch, 22s.; mixed lengths, 16s. 6d. per lb.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR JULY.

| Article. | | | | | | | | JULY. | | |
|---------------------|-----|-----|-----|-----|-----|-----|-------|-------------|----|------------------|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bacon | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7 $\frac{1}{2}$ |
| Bran | ... | ... | ... | ... | ... | ... | ton | 5 | 8 | 1 $\frac{1}{2}$ |
| Butter, First | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 11 $\frac{3}{4}$ |
| Butter, Second | ... | ... | ... | ... | ... | ... | " | 0 | 0 | 7 $\frac{1}{2}$ |
| Chaff, Mixed | ... | ... | ... | ... | ... | ... | ton | 3 | 15 | 0 |
| Chaff, Oaten | ... | ... | ... | ... | ... | ... | " | 4 | 10 | 0 |
| Chaff, Lucerne | ... | ... | ... | ... | ... | ... | " | 4 | 0 | 0 |
| Chaff, Wheaten | ... | ... | ... | ... | ... | ... | " | 2 | 12 | 6 |
| Cheese | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7 $\frac{1}{4}$ |
| Flour | ... | ... | ... | ... | ... | ... | ton | 8 | 18 | 9 |
| Hay, Oaten | ... | ... | ... | ... | ... | ... | " | 4 | 11 | 3 |
| Hay, Lucerne | ... | ... | ... | ... | ... | ... | " | 3 | 5 | 0 |
| Honey | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 1 $\frac{3}{4}$ |
| Japanese Rice, Bond | ... | ... | ... | ... | ... | ... | ton | 12 | 5 | 0 |
| Maize | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 6 $\frac{3}{4}$ |
| Oats | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 3 |
| Pollard | ... | ... | ... | ... | ... | ... | ton | 5 | 5 | 0 |
| Potatoes | ... | ... | ... | ... | ... | ... | " | 4 | 0 | 0 |
| Potatoes, Sweet | ... | ... | ... | ... | ... | ... | " | 1 | 13 | 1 $\frac{1}{2}$ |
| Pumpkins, Table | ... | ... | ... | ... | ... | ... | " | 1 | 11 | 3 |
| Sugar, White | ... | ... | ... | ... | ... | ... | " | 14 | 10 | 0 |
| Sugar, Yellow | ... | ... | ... | ... | ... | ... | " | 12 | 10 | 0 |
| Sugar, Ration | ... | ... | ... | ... | ... | ... | " | 10 | 7 | 6 |
| Wheat | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 3 |
| Onions | ... | ... | ... | ... | ... | ... | cwt. | 0 | 7 | 9 |
| Hams | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 9 $\frac{3}{4}$ |
| Eggs | ... | ... | ... | ... | ... | ... | doz. | 0 | 0 | 11 $\frac{3}{4}$ |
| Fowls | ... | ... | ... | ... | ... | ... | pair | 0 | 3 | 11 $\frac{1}{4}$ |
| Geese | ... | ... | ... | ... | ... | ... | " | 0 | 5 | 9 |
| Ducks, English | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 9 |
| Ducks, Muscovy | ... | ... | ... | ... | ... | ... | " | 0 | 4 | 8 $\frac{1}{4}$ |
| Turkeys, Hens | ... | ... | ... | ... | ... | ... | " | 0 | 6 | 9 |
| Turkeys, Gobblers | ... | ... | ... | ... | ... | ... | " | 0 | 14 | 3 |

ENOGGERA SALES.

| Article. | | | | | | | | JULY. | | |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-------------|----|------------------|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bullocks | ... | ... | ... | ... | ... | ... | ... | 5 | 11 | 10 $\frac{1}{2}$ |
| Cows | ... | ... | ... | ... | ... | ... | ... | 3 | 4 | 4 |
| Wethers, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 5 $\frac{1}{4}$ |
| Ewes, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 8 | 4 $\frac{1}{4}$ |
| Wethers, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 12 | 3 $\frac{1}{4}$ |
| Ewes, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 12 | 3 |
| Lambs | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 5 $\frac{1}{4}$ |
| Baconers | ... | ... | ... | ... | ... | ... | ... | 1 | 17 | 6 |
| Porkers | ... | ... | ... | ... | ... | ... | ... | 1 | 6 | 6 |
| Slips | ... | ... | ... | ... | ... | ... | ... | 0 | 14 | 6 |

Orchard Notes for September.

By A. H. BENSON.

THE planting and pruning of all deciduous trees should have been completed even in the coldest districts by the end of August, and during the present month the orchardist should disbud and thumb-prune the young trees as soon as they start out into growth. Judicious thumb-pruning is necessary in order to reduce the number of branches, only those buds being allowed to develop into branches that will be required to form the future head of the tree, all the rest being either removed or, better still, pinched back and converted into spurs which will eventually bear fruit and which, meanwhile, will produce a tuft of leaves that will tend to strengthen the branch and to protect it from sunburn. Spraying should be continued during the month in the case of deciduous trees attacked by fungus diseases, such as the shot-hole fungus or rust of the apricot and the Windsor pear blight of pears, the material used being Bordeaux Mixture. Where leaf-eating insects of any kind are troublesome, a little Paris green—1 oz. to 10 gallons—should be added to the Bordeaux Mixture, the spraying material being then both an insecticide and fungicide, and two pests are destroyed by the one spraying. Vines that have not been treated for black spot, as described in the Orchard Notes for August, should be treated at once; and vine-planting should be done during the beginning of the month, though if the cuttings have been kept in a cold place planting can be continued all through the month. In planting grape-cuttings, see that the cutting is always planted firmly, and that the soil comes into direct touch with it all round, as, if not, it is very apt to dry out. Plant the cutting with the top eye just on a level with, or rather slightly below, the surface of the ground, not with 6 inches or more of the cutting sticking out of the ground, as the nearer to the ground the main stem of the vine starts the better the vine will be, and the easier will be its subsequent training.

Orange-trees will be in full blossom during the month, and in the earlier districts the young fruit will probably be ready to treat for Maori or rust towards the end of the month. Maori is caused by a very small mite, which begins its attack on the young fruit when it is about the size of a marble, though the injury it causes is seldom noticeable till the fruit begins to ripen. Spraying the trees with a mixture of sulphur and soft soap, or with a weak solution of sulphide of soda, or dusting the trees with fine sulphur will destroy these mites. During the end of the month pineapple and banana suckers may be set out during favourable weather in the earlier districts, but it is not advisable to plant out too early, as they do not root readily till the soil is thoroughly well warmed. Orchards and vineyards should be kept well cultivated during the month, as if there is a dry spring the success of the crop will depend very much on the manner in which the orchard is kept, as the better the orchard is cultivated the longer it will retain the moisture required by the trees for the proper development of their fruit. Quickly acting manures, such as sulphate of potash, sulphate of ammonia, and superphosphate, can be applied to fruit trees during the month if there is any suitable showery weather, but should not be applied during either a very dry or very wet spell. Fruit trees should be mulched, and when cow-peas are required for mulching they can be planted towards the end of the month.

During the month a careful examination should be made of all fruit to see if any contains larvæ or fruit fly; and if such are found, they should be destroyed, as if extreme care is taken during this and the two following months

to destroy the larvæ of all fruit flies, whenever and wherever found, this great curse of the fruitgrower would be greatly reduced, as it is on the careful destruction of the earlier broods of flies that the saving of the main crop of fruit will principally depend. Though the first damage caused by the flies is comparatively insignificant, they reproduce themselves so rapidly that a few mature insects in the beginning of the season become many thousands before it closes.

Farm and Garden Notes for September.

Farm Notes.—Keep the hoes, hand and horse, vigorously going. It will save much labour as spring merges into summer and the customary wealth of weeds makes its unwelcome appearance. Earth up potatoes already growing, and finish planting this crop during the month. Sow maize, sorghum, broom millet, imphee, panicum, prairie-grass, tobacco, and pumpkins. Plant sweet potato vines; make the cuttings from 8 to 12 inches long; plant in ridges with a dibble, and press the soil firmly round the plant. Carry on cane planting. Plant out coffee, ginger, arrowroot, and yams.

Kitchen Garden.—The ground is now warm enough to sow most of the summer vegetables, and as many suitable varieties as can be grown should be planted. Do not stick to the everlasting cabbage and pumpkin, because many other good vegetables will thrive during the hot weather with a little care. Beans: Lima beans should now be sown in rows $2\frac{1}{2}$ or 3 feet apart for the dwarf kinds, and 6 feet apart for the climbers. This is an excellent summer vegetable; and the warmer the weather, the better the Lima bean likes it. Kidney or French beans, and runner beans, such as Madagascar, can also now be sown. Beet: A few rows may be sown. Cabbages: Sow a little St. John's Day or Early Jersey Wakefield, and put out any plants that may be ready. Carrots: Sow a few rows. Celery: A little seed may be sown in a box in very fine soil. Cucumbers, marrows, squashes, rockmelons, watermelons, and pumpkins should be sown without delay. Onions: A few drills for salad should be sown. Peas: These may still be sown, except in the very hot districts. Capsicums and tomatoes should be sown, and if any plants are available set them out in showery weather. Turnips: Sow a few drills; turnips, especially in summer, should not be sown broadcast. This is a system which is a century out of date. Rhubarb: Seed may now be sown in a box to furnish plants for next winter.

TRANSPLANTING.

TRANSPLANTING is checked in periods of drought, and proceeds slowly when it has to be followed by the waterpot. Yet seed-bed plants must be put out when they have attained a suitable size, or they soon become coarse and unwieldy. If the root is too long, it is difficult to adjust it properly, and a plant stuck in the ground with the root doubled up at the end has not a fair chance. In planting cabbage, or any member of the *Brassica* family, three points are of vital importance: There should be a fair-sized hole made with the dibber; the root should be dropped straight down in the hole; and then the earth should be closed around the root firmly. When the ground is very wet, planting is impracticable, as the labourer treads the surface of the ground, the top becomes poached, the dibber squeezes the soil and compresses the particles together, and,

as they dry up, they encase the fibres as in a vice. Consequently, after heavy storms or hasty rainfall, planting has frequently to be suspended a few hours until the field gains its dryness and solidity. On light land with thorough drainage the land soon recovers its equipoise; it sustains the weight of the workman, and he is able to execute his task in a satisfactory manner. On heavy soil more patience is requisite. Where four hours may suffice in the former case, two days may be needed in the latter. This applies to planting and many other operations; and as in gardening time is often of immense importance, gardeners prefer to have light land to deal with, in general. Some heavy land on a large farm is no drawback, provided that the bulk of the holding is of a soil that dries quickly. Even on the same farm there exists often a marked difference in this respect, and work may be continued on one side where the substratum is sandy, whilst it is impossible to proceed on another where the substratum is of clay. As a rule, no garden crop flourishes if it is planted or transplanted when the soil is overloaded with moisture, and it is often very easy to discern subsequently where work has been resumed too soon after the rain. The ground becomes like pie-crust, cannot be adequately stirred, and the plant is starved because its fibres are bound in and hampered.

Horticultural Notes.

By PHILIP MAC MAHON,
Curator, Brisbane Botanic Gardens.

ABOUT the middle of September, when these notes reach the most distant reader of the *Journal* in Queensland, the weather will have become sensibly warmer—in fact, the semi-tropical spring will be well on the way. From August to September there is a rise of 6 degrees in the mean shade temperature at Brisbane, and from September to October a rise of 5 degrees. The average number of wet days are nine in September, and ten in October; and the mean average rainfall 2·07 inches for September, and 3·00 inches for October.

You will have hurried up the preparation of all land for the cultivation of tropical and semi-tropical plants during the previous month, and be able to commence planting as soon as genial showers and increased night temperatures will enable you to do so with a fair chance of success. In our climate, often when it is quite hot in the daytime at this period of the year, it is quite cold at night; and this is very hurtful to a very large class of plants, of which crotons, coleus, and acalyphas may be taken as the types. When you have any planting on a tolerably large scale to do, it will always pay to do it with system. The position of every plant should be determined before it leaves the nursery. It is by far the better plan to place a stake in the position which each plant will occupy, and bear in mind when you come to look over these stakes, with a view to deciding how many plants you will require, the shape, size, colour, and habit of every plant, and arrange so as to have them harmoniously blended. What would you think of a painter who would set out to paint a picture which would do him credit and give pleasure to many, yet who would simply lay on whatever colours should happen to come handiest, and let the picture come into being somehow, just as things happened to turn out? Yet you have often seen gardening done like this; in point of fact, it is rather rare to see it done in any other way.

As root action increases, owing to increased warmth, the roots will begin to make large demand upon the soil for some nourishing material to drink, for the plant takes all the portion of its nutriment which it derives from the soil in a

liquid form. Unless the material is there, and not only there, but in such a form that the plant can immediately use it, then the plant suffers. A plant may starve in the midst of plenty of food material present in the soil, if that food material is not present in such a soluble form that the plant can use it. An example:—The wheat plant requires silica in order to exist, but wheat has been grown in soils containing a large proportion of this very element and yet almost perished for want of it, because the silica was not present in a soluble form so that the plant could drink it in, just as a man might starve in the presence of a large quantity of flour, because it would not be food in an available form until cooked. A capital means for the application of manure to gardens is in a liquid form. Immense quantities of money's worth in the shape of manure are annually wasted in Queensland, where the valuable town refuse is got rid of at considerable expense in a manner that belongs to the pre-historic era of sanitation.

Every gardener who would see his favourites flourish should have a liquid manure tank amongst the permanent fixtures on his premises. This, filled up with water and a few shovelfuls of manure (preferably sheep manure) thrown in, will provide him with a stock of readily available food for his plants at the period when their wants are greatest—i.e., in the coming spring weather. It is a capital plan to get a piece of rough gunny bag, and to tie up in it a few pounds of soot, and throw this into your liquid manure tank. You will be surprised at the difference which this will make in the appearance of the leaves of your plants, imparting to them a bright glossy appearance, which is the sign of vigorous health.

This month we shall plant out at the Botanic Gardens a good large plot of coffee. The plants for this have been getting ready for two years. They are now fine, healthy fellows, about 2 feet 6 inches in height, and about $\frac{3}{4}$ -inch through at the base. You would feel tempted, if you had such healthy and vigorous plants, to plant them and let them grow on as they are, but we shall not do that. We shall "stump" them. We shall lift them very carefully when the nights become warmer, and carefully prune off roots which are destitute of the small rootlets so necessary to the health of most plants; that is to say, we shall shorten such roots back. The plants have been already transplanted, so that they have now a mass of fine fibrous roots. When we are planting them we will cut the stems down to within 3 or 4 inches of the ground. This is called "stumping." They will then shoot out, and of the shoots thus produced one shall be saved, and will grow with considerable vigour; and this will be our future main stem. This, as it grows, will require "handling" in order to make the future tree into a symmetrical and profitable plant.

Dahlias should be planted this month, care being taken to have the position well enriched by the use of manure. Cuttings of all tropical plants should be put in. Coleus cuttings should be put in at once. Cuttings of these plants are so easily procured that there is no excuse for the existence of the miserable specimens one so often meets with. Bear in mind to disbud roses as they make new growth, and keep them trained as you go along. This is much better than having a great pruning and tying-up match once a year. Keep the cultivator very busy amongst all borders and beds. If you get the upper hand of weeds now, and keep them from seeding, you will be able to keep them in check all the year.

Your chrysanthemums will require to be divided this month early, and it will be well to lay your plans as to where you propose to have the next year's display, for you must get a piece of well-enriched ground to plant the offsets into. The chrysanthemum loves generous living, and will brook no starvation, so that it will quickly resent receiving the leavings of some other plant. Stake up all plants which require it, such as gladioli, and do not fix a stake large enough to support a haystack, as some do. Your garden should not look like a fine collection of stakes with a few plants attached. Many bulbous plants will

now be coming forward, and these will in many cases require a very small stake to keep some of them upright. Stakes should never be used if they can be dispensed with, and when used should not be made obtrusive on any account.

Shade-garden and veranda plants will now stand in need of repotting. It generally suffices to pot a fair-sized plant into the same-sized pot as that from which you take it. There seems to be a general idea that plants always want a shift into a larger pot, and you sometimes, or rather often, hear a person say, when contemplating some miserable specimen in a pot seven sizes too large for it, "Oh, yes, it is not doing well; I must shift it into a larger pot." Above all things in potting plants, have the pots clean. They should be washed and dried thoroughly before being used again. Remove from the surface of plants in the shade-garden as much of the dried and used-up soil as you can without injuring the roots, and replace it with fresh earth. It is better to do this a little at a time, so that the plants may have a continuous supply.

Plate OXXXII.



STATE FARM EXHIBITS AT BOWEN PARK.—THE QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Agriculture.

WHAT CAN BE DONE ON A SMALL FARM.

THE *Tenterfield Star* gives the following instance of practical farming taken from the *Gulgon Advertiser*:—"At Guntawang last year Mr. Rouse planted 200 acres with wheat. In August and September he turned in 1,500 sheep, and fattened them for the market off the young wheat. In December he had the whole mowed and stacked. In January he threshed the stack. The result was 33 bushels of first-class grain per acre, and 200 tons of straw. Putting the extra value of sheep at 1s. 6d. per head, the ground yielded £112 10s. for this item. The grain sold at 2s. 6d. per bushel—£950. The straw as it now stands is worth £175. Thus the total amount this 200 acres returned last year was £1,137 10s.; or nearly £6 per acre."

There appears to be an error in the cash return for the grain. Thirty-three bushels per acre means 6,600 bushels on 200 acres. The selling price being 2s. 6d. per bushel, the value would £825 instead of £950, a difference of £125. However, even with this deduction the 200 acres returned £1,012 10s. It would have added much to the interest of this paragraph had Mr. Rouse shown what expenses were incurred in obtaining such a good result.

We have occasionally been asked how a man can make a living on 160 acres in Queensland. The answer to that is—It depends upon the man's energy and knowledge of his business, the working power of his family, the seasons, and the distance of the land from an accessible market.

A correspondent of the *Agricultural Gazette* of New South Wales says:—"From about 14 acres of mixed farming and gardening and 26 acres of grazing land, making up a total of 40 acres, with from 15 to 20 colonies of bees, and rearing a few pigs, I have had results that I consider (for such seasons as we are having) quite satisfactory—realising from £100 to £150 per annum."

Now, a small farmer who clears £150 per annum may be classed amongst the happy men of the earth. He calls no man master. He lives comfortably, pays no rent, pays his way, has a healthy if laborious life, and takes his occasional holiday with his family without asking anyone's permission. Of course, farming is not all "beer and skittles."

Droughts, floods, plant diseases, and insect pests help to reduce the yearly income; but, on the whole, a steady, hard-working farmer, with a steady, hard-working wife and family, on good land within easy distance of a market, is not the man who often figures in the insolvent court.

He is a privileged growler; ruin is always staring him in the face; the season is always too wet or too dry, too hot or too cold, but, in spite of all this, he manages to come out reasonably well at the year's end.

Now, we give here some experiences of small farming in Queensland. The figures are facts, being taken from the farm-books kept at the time; and although prices are, in some instances, lower than they were in our experience between the years 1861 and 1872, still there is a good lesson to be learnt from them.

In those "good old days" men did not go in for large farms; 60 acres was considered a good handy farm, especially when most of the land was deep, rich scrub soil on the banks of a river. There were no roads, except what the farmer made himself; therefore horses and drays were not required. The river was the road, a boat the vehicle of transport, and the farmer and his sons or hired man the motive power.

Settled on his farm, the farmer began to clear, and as every acre was burnt off it was immediately planted with corn, pumpkins, and potatoes, beds of vegetables, and large areas of cabbages. Vines and fruit trees, pigs, fowls, cows, and bees followed. By the end of the year some 15 to 20 acres have been cleared. Meanwhile, crops have been harvested and sold, and the land replanted till regular returns from the cleared land came in yearly, and fruit trees, vines, and small fruits began to contribute their quota.

The following extract from the books will show how things worked out on 20 acres of cultivation:—

| | | £ | s. | d. |
|---------------|--|-------|----|----|
| 5 | acres of lucerne, producing 18 tons of hay at £2 10s.... | 45 | 0 | 0 |
| 2 | „ potatoes „ 8 „ at £5 ... | 40 | 0 | 0 |
| 6 | „ maize „ 360 bushels at 2s. ... | 36 | 0 | 0 |
| 1 | „ sweet potatoes, producing 10 tons at £2 ... | 20 | 0 | 0 |
| | Pumpkins sown with maize, 30 tons at £1 ... | 30 | 0 | 0 |
| 1 | acre cabbages, 500 dozen at 2s. per dozen ... | 50 | 0 | 0 |
| 2 | acres green oats—feed for stock. | | | |
| $\frac{1}{2}$ | acre onions, 5 tons at £6... .. | 30 | 0 | 0 |
| $\frac{1}{2}$ | „ swedes for stock. | | | |
| $\frac{1}{2}$ | „ vegetable garden | 36 | 0 | 0 |
| $\frac{1}{2}$ | „ strawberries, rosellas, &c. | 15 | 0 | 0 |
| 1 | „ grapes, 2 tons at 1d. per lb. | 18 | 16 | 8 |
| 20 | hives of bees, 140 lb. per hive at 2d. | 23 | 6 | 0 |
| 20 | hens, 3,709 eggs per annum, at 1s. per dozen ... | 15 | 9 | 1 |
| 10 | pullets at 1s. 6d. each | 0 | 15 | 0 |
| 8 | cockerels „ „ | 0 | 12 | 0 |
| $\frac{1}{2}$ | acre bananas, 500 bunches at 1s. | 25 | 0 | 0 |
| 400 | lb. butter at 1s. per lb. | 20 | 0 | 0 |
| 2 | bacon pigs... .. | 3 | 0 | 0 |
| 8 | suckers at 10s. | 4 | 0 | 0 |
| | | <hr/> | | |
| | | £412 | 18 | 9 |

The vegetable garden brought in £36 between 28th September and 10th March—a little over five months. This is equivalent to about £72 per acre per annum.

A small farmer at Warra, writing to this *Journal*, says:—“I must say I have made a very good living during the last few years by mixed farming. I have been wine-making and growing potatoes, corn, and various kinds of fruit and vegetables. I started in 1885, and worked on the railway line till I got things in order on the farm, which consists of 160 acres. I only utilise 100 acres, as 60 acres is still standing scrub; 15 acres are cultivated with ordinary crops, and 10 acres are devoted to garden and orchard. Last year I made 250 gallons of wine, which I sold at 6s. per gallon—£84. I sold 2 tons of grapes at 1½d. per lb.—£28 5s.; onions brought me in £10; oranges, £13; pigs, £10; honey (1½ tons at 2d. per lb.), £25; other fruit trees, £12; milk and butter from 7 cows bring the total income to over £200. I work the farm with the help of my two sons, and we grow everything we require for our own use besides. I have now one acre of brown Spanish onions growing splendidly, also one acre of silverskin pickling onions. I ought to do well out of these, as my ground is particularly well adapted for onions. Last season I was late in sowing the seed, or I should have realised £20 per ton. The maize was a comparative failure; I only got 11 bags from five acres—a little over 8 bushels per acre. I should mention that my 10 acres of garden is divided as follows:—2 acres grapes, 4 acres fruit trees of various kinds, 2 acres of potatoes, 2 acres of onions. From this short summary you will see that I am making what I consider a very comfortable living. I have been farming and gardening all my life with the exception of 12½ years, when I worked at other pursuits to enable me to raise money enough to make a start. When I did start, people told me I would not be able to grow enough stuff to feed a snipe. I have proved them to be wrong. My land was all scrub, overrun with wallabies, and there was

not a blade of grass to be seen anywhere. Now it is practically flowing with milk and honey. It is a second Canaan, and I have never regretted taking it up. It has turned out a real success. The reason people fail at small farming is that they know nothing about the business. They start with the belief that any ignoramus can work a farm, and by-and-by they find out that they required a knowledge of the work to enable them to succeed. I think I have opened the eyes of the croakers, and now several good men are following my lead."

Professor Thomas Shaw, of Minnesota, gives in the *Rural New Yorker* some figures in connection with small farming, or rather market gardening, which will surprise those who have never tried to discover what an amazing amount of produce a small patch of good soil can be made to produce under good management.

He says :—"I have tilled a little piece of land with spade and hoe for the past four years, and the produce obtained from it every year is simply extraordinary. The garden covers but the nineteenth part of an acre, and the following is the record of the production from it in 1897 :—

| | | | | | |
|-----------------------------|-----|-----|-----|-----|--------------|
| Onions, used green | ... | ... | ... | ... | 854 plants |
| " matured | ... | ... | ... | ... | 52 quarts |
| Radishes | ... | ... | ... | ... | 2,126 plants |
| Spinach | ... | ... | ... | ... | 882 " |
| Cucumbers, used green | ... | ... | ... | ... | 565 fruits |
| Lettuce | ... | ... | ... | ... | 585 plants |
| Summer savory | ... | ... | ... | ... | 210 " |
| Sage | ... | ... | ... | ... | 77 " |
| Parsley | ... | ... | ... | ... | 90 " |
| Peppergrass | ... | ... | ... | ... | 56 " |
| Corn, used green | ... | ... | ... | ... | 191 ears |
| Cabbages | ... | ... | ... | ... | 65 heads |
| Cauliflowers | ... | ... | ... | ... | 16 " |
| Potatoes | ... | ... | ... | ... | 74 quarts |
| Tomatoes, used on table | ... | ... | ... | ... | 60 fruits |
| " harvested | ... | ... | ... | ... | 3 pecks |
| Vegetable oyster | ... | ... | ... | ... | 4 " |
| Fall turnips | ... | ... | ... | ... | 6 " |
| Pumpkins | ... | ... | ... | ... | 25 fruits |
| Citrons | ... | ... | ... | ... | 15 " |
| Squashes | ... | ... | ... | ... | 5 " |
| Beans, used green | ... | ... | ... | ... | 4 quarts |
| " ripe and shelled | ... | ... | ... | ... | 3 " |
| Beets, used while growing | ... | ... | ... | ... | 78 plants |
| " harvested | ... | ... | ... | ... | 4 pecks |
| Carrots, used while growing | ... | ... | ... | ... | 102 plants |
| " harvested | ... | ... | ... | ... | 6 pecks |
| Peas in the pod, used green | ... | ... | ... | ... | 64 quarts |

"The soil, when broken in the autumn of 1893, was poor and raw. The subsoil was sandy in texture, yet it had enough clay in it to make it very hard in dry weather. The surface soil was made land, and consisted of the ordinary mould of the prairie. It was so shallow that on much of the plot the spade struck the stony, hard subsoil at about half its depth. The subsoil had been placed there when the cellar was dug. The only manure used was what may be called the equivalent of one load of farmyard manure when somewhat reduced by fermentation. This manure came from the horse stable, and in the fresh form was used for banking the cellar in winter. Then it was taken each spring to the rear of the lot and shaped into a sort of compost heap, which receives the waste from the house, and in the autumn was spread over the land and buried when the garden was dug. No water was used in summer other than what fell from the clouds, except on rare occasions a little was applied by hand to newly set or struggling plants."

A CALIFORNIAN HARVESTER.

THE improvement in harvesting machinery appears by no means to have reached its limit. From California we hear of a new machine called "The Complete Harvester." This machine does away with the twine bill, no inconsiderable item on large holdings. The steam thresher is not necessary, although steam has been employed to show the great capabilities of the harvester. But horse-power is quite equal to its demands. It is made in various sizes to cover 14, 16, 24, and 30 feet. The 14-foot machine would seem to be best adapted for use in this country, where immense areas are not laid down in wheat. The harvester reaps, threshes, cleans, and grades in one operation, and the cost to the farmer varies from 12 cents (6d.) per 100 lb. of clean grain in the sack for a good crop to 16 cents (8d.) for a poor one. The entire cost of reaping, threshing, cleaning, and bagging averages 14 cents (7d.) per 100 lb., equal to a little over 4d. per bushel. The system in California is to harvest at so much per 100 lb. of clean grain bagged, and this machine enters a field and leaves the sacks in heaps of about 5 cwt. on the ground behind it. The cost of reaping, binding, stooking, stacking, and threshing in this colony is about 1s. per bushel, so that, if the harvester can do all that is claimed for it, a very large saving could be effected by its use.

DESTRUCTION OF CHARLOCK.

SUCCESSFUL CHARLOCK SPRAYING AT ASPATRIA.

PROFESSOR Henry F. Hill, writing on experiments made at Aspatria Agricultural College, says:—

Judging from newspapers reports, the results of spraying charlock appear to have been very varied. As our experiments have now proved beyond doubt to be a complete success, it may be of interest to your readers for me to describe how and when the operations were carried out.

The field experimented on has been a great grower of charlock for many years, and in this respect is considered the worst in the neighbourhood. It is about two acres in extent, seeded with oats after lea, and was kindly lent for experiment by Mr. Harry Graves.

Before spraying the charlock was in full bloom, standing from 12 inches to 14 inches high, about on a level with the oats. The leaves of the charlock had become small, and the stems rather tough; it was feared at the time that we were a little late in starting the spraying, which afterwards proved not to be the case.

The first plot of nearly three-quarters of an acre was sprayed on Monday, 12th June, with 2 per cent. solution of copper sulphate at the rate of 40 gallons per acre. The weather was hot and dry, and had been so for some time. The plot was examined next day, when the charlock had the appearance of only being slightly checked. It was then decided to spray a small plot with 2½ per cent. solution at the rate of 60 gallons per acre. This was done on Wednesday, 14th June, and on the same day another plot of about half an acre was sprayed with an 8 per cent. solution of sulphate of iron at the rate of 60 gallons to 70 gallons per acre. The field was inspected on Friday, 16th June.

Plot 1 (sprayed with 2 per cent. solution copper sulphate): A large proportion of the charlock was dying off; corn slightly affected by the spraying.

Plot 2 (sprayed with 2½ per cent. solution copper sulphate, 60 gallons per acre): Charlock almost entirely destroyed; corn affected by the spraying.

Plot 3 (sprayed with 8 per cent solution iron sulphate, 60 gallons to 70 gallons per acre): Charlock turned black, and appeared to be entirely done for; corn only slightly affected by the spraying.

In order to make comparisons and draw conclusions, one part of the field was left unsprayed. The line of demarcation between the sprayed and unsprayed was as definite as between the ploughed and unploughed portion of a lea-field.

On the Sunday and Monday a few days after the spraying, some heavy showers fell. This was just what was required to see if there was sufficient nourishment left in the stem to produce seed.

On examining the field at this date—18th July—we find several plants producing pods on Plot 1, but about 75 per cent. of the charlock has been killed.

On Plot 2 about 97 per cent. has been destroyed. Although the corn received a slight check after spraying, it appears to be a full crop now.

On Plot 3 fully 95 per cent. of the charlock has succumbed to the spraying; the corn is slightly darker, and appears to be a fuller crop than the unsprayed plot adjoining.

The chief conclusions that may be drawn from the experiment are as follow:—

- (1) A 2 per cent. solution of copper sulphate, or an 8 per cent. solution of iron sulphate, is strong enough.
- (2) It is better to increase the number of gallons of solution per acre than to increase the strength of the solution.
- (3) Although 40 gallons of solution per acre is sufficient when charlock is not abundant, at least 70 gallons per acre should be used where charlock is thick.
- (4) Each plant must be thoroughly drenched in order to prevent it producing pods.

A few hints to those who wish to carry out the experiment at some future date may be acceptable.

A paraffin cask sawn across the bung makes two good tubs for mixing the solution in. If possible, fill the water barrel from the pump, in order to get water free from sediment. If obtained from a stream, it should be strained before going into the mixing tubs. Dirty water chokes the sprayer. Put about 15 gallons of water in each tub, place 3 lb. of copper sulphate, or 12 lb. of iron sulphate, in a calico bag, and keep stirring the water in the tub with the crystals in the bag; it will dissolve in about 12 to 15 minutes. The rough crystals take rather longer to dissolve than the crushed. If the crystals are placed in the water instead of being dissolved from a bag, they have a tendency to choke the sprayer. The copper sulphate should be guaranteed 98 per cent. pure. Spray about 4 yards wide at a time, using skinned sticks as guides. Walk in the direction of drill or plough furrow to prevent stepping down the corn.

THE CULTIVATION OF BROOM CORN.

CUTTING.

By DANIEL JONES,
Department of Agriculture.

In planning out this operation, the farmer must give ample heed to retain sufficient labour, as he may require to deal expeditiously with the crops.

It is needless to point out the importance of getting the fibre saved without undue exposure to wet weather, for on the good fortune of the grower in this respect a considerable amount of the value of the crop depends. I have often been caught in my harvesting operations by wet weather, but providing the cut material can be got off the field without much delay, and speedily dried, the effect of the rain will not be very serious. On the other hand, should incessant wet weather eventuate, some considerable loss may be expected, inasmuch as the fibre will become discoloured, while that which may be lying out in the field will deteriorate considerably. Thus it is almost imperative for

the farmer to make such provision for additional assistance as will meet this contingency. Generally speaking, the most useful class of hands for this work will be boys of from 14 years upwards, as they are usually more active than older persons, and, the work being light and demanding deftness more than hard effort, it is more adapted to this class of labour. In this matter of finding a sufficient supply of hands at the critical period of harvesting lies, to a great extent, as far as our remote rural districts are concerned, the problem as to whether this industry can be carried out on a paying scale on a large area. Many American planters grow areas amounting to 300 acres; this in most of our country districts would involve the farmer in difficulties with regard to obtaining sufficient assistance to cope with the work. Thus it remains with the farmer, when forecasting his operations, to give this feature a very careful consideration. However, judging by our experience in cotton-growing times 35 years ago, it may not be impossible to again entice our unemployed town lads to engage temporarily in a rural occupation to their own and to the farmers' mutual advantage. Of course, where the farmer contemplates the cultivation of small areas the problem of sufficient labour will most probably be satisfactorily solved by the farmer enlisting the assistance of his neighbours and returning the compliment as occasion demands.

At the very outset of cutting operations, the grower is confronted with the problem as to what is profitable to cut and what to discard. In most seasons there will be a proportion of stalks that carry only thin, dwarfed broom-heads, which in themselves are too light to be profitably handled, unless the farmer has cheap and abundant labour. It is hardly possible to lay down a fixed rule as to what inferior tops to cut or reject. It will very materially depend upon demand and price. My own practice is to discard rather than err on the side of harvesting inferior heads. When the trouble of cutting, handling, stripping, sorting, and baling is taken into account, and the meagre return in weight resulting from dwarfed heads, it is possibly better to convert your small tops into stock or poultry food, as the seed is more often the most valuable part of the rejected heads. I simply point this out so that the grower may avoid having a lot of small corn on hand that would have been more profitably left alone. In the making of millet brooms, it is very necessary that corn of various lengths be supplied. As a rough guide to marketable broom-heads, it may be taken that any that show 6 inches of fair brush will be about the minimum of useful heads. From this the fibre ranges to as much as 2 feet 6 inches in length, which is rather over the length best adapted for ordinary broom manufacture, inasmuch as an excessive length means cutting to waste. Generally speaking, the average of the best brooms locally made runs to about 20 inches. Thus fibre approximating this standard will, in the commercial sense, be most prized. Discrimination must be used when cutting short or long heads. When handling short tops, it is necessary to lop off at a little further distance from the commencement of the fibre, leaving a stalk about 6 to 8 inches long, while with the longer heads a shorter stalk will do—say from 4 to 6 inches as a rule. I have often observed farmers commit the error of cutting the stalk quite close to the fibre. This practice is a wrong one, as it results in a loss of weight, and is sometimes a disadvantage to the broom-maker if the fibre is required for certain parts in building the broom. With the preceding suggestions borne in mind, active operations may begin. For the purpose of cutting off the heads, a good, strong, table carving or butcher's knife is as good an implement as can be used. Thus equipped, start the cutters operating between two rows, each cutter depositing the tops so as to have as many rows in one as convenient, placing the tops in regular order in small heaps, care being observed that tops and butts are laid one way. This plan greatly hastens operations. Too much attention cannot be paid this practice, as in drying and stripping, if butts and tops are kept in proper order, the handling and sorting are very much simplified. When it is considered that in harvesting one acre of this crop, at a reasonable computation, 25,000 broom-heads will have to be cut, some idea of the celerity needful to profitably handle

the product may be formed. The cultivation and handling of broom corn call for much more push and more active, well-sustained effort than any crop I am acquainted with, and the farmer who is not prepared to push the work had better not contemplate going in largely for its cultivation. Not only is this true of cutting, but also of all subsequent operations, there being so much manual work involved, though light in its nature, and therefore especially fitted for active lads, but it must be performed with expedition to secure profitable results.

In cases where the crop is tall and has not been bent, I have found it a good plan to send a lad ahead of the cutters to turn down the stalks; this is done by the lad putting his arm around several stalks and bending them down over his arms. This obviates the necessity for the cutters reaching overhead for the tops, and, as they have the work within easy reach, much more is done and with greater comfort. As before stated, the brush is lopped off from 4 to 8 inches from the base of the brush. It will also be necessary at the same time to pull off the sheath enveloping the lower portion of the fibre while in hand. This is acquired by practice, and, if the cut is made close to and above the last joint, the sheath comes off easily; but if cut below the joint the sheath hangs on and is quite difficult to separate. Care must be taken to ensure this being done; otherwise, when stripping the seed off, the sheath becomes an impediment in cleaning the fibre as well as when curing the brush.

Should the grower be cutting the fibre in its young stage—that is, before the seed is matured—care must be taken to avoid heaping the brush in large quantities, inasmuch as the heads may sweat and become discoloured, but if handling matured fibre quite so much care is not necessary. The broom-heads, when the weather promises to remain fine, may with advantage be left in the field a day or two, which will help forward the operation of curing.

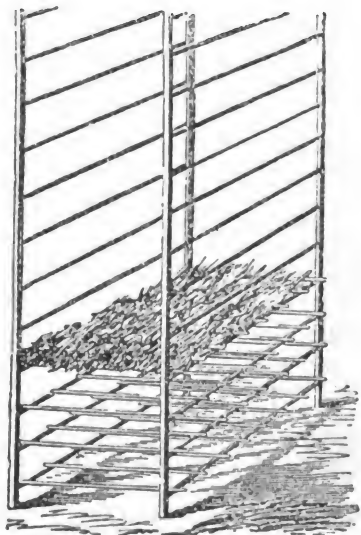
Some American growers describe a practice which is called “tabling” the crop, which consists in bending each stalk a foot or so from the ground, laying each crosswise over the other. Judging from my personal experience, this method is not one to encourage our growers to adopt; hence I refrain from treating on the matter, as I am fully convinced of its impracticability, having in view our conditions of climate and labour. The accompanying illustration will give the grower some conception of what I allude to.



CURING.

Although it may be possible to perform a part of this process in the field, it is by no means a sound practice to attempt it wholly. It is important to notice that the fibre, if exposed any length of time to the strong rays of our summer sun, will become brittle and lose colour, and thus seriously affect the quality of the material for manufacturing purposes. The best cured material is that which is handled under shade, but as this means extensive shed accommodation it may

not, in the case of the new settler, be possible to carry out the operation in this manner. Should the farmer contemplate growing this crop in large areas, this matter of shed room will need ample consideration, as in the event of wet weather abundant space will be required to spread the brush to prevent it sweating, which it speedily does when stacked in large quantities without sufficient ventilation. My practice is, when shed room is ample, to stretch wire-netting across the building in several sections, suspending the netting from the crossplates with fencing wire, and spreading the fibre evenly on it to a thickness of about 6 inches or so, according to the state of the crop. If the material is moderately dry, it will not require much treatment inside, providing the weather is fine, but in the event of wet weather intervening it will require to be often turned to prevent heating and sweating. In continued fine weather, if compelled to dry the fibre in the open, it may be spread on racks and frequently turned to prevent undue exposure to the sun while drying. During dry hot weather, the farmer will find the crop easy to deal with, and he will need to watch that the heads are not over-dried to the extent of imparting brittleness to the fibre and loss of that attractive fresh colour that gives value to the product. A good system of building a frame or rack for drying purposes is as here illustrated. The crosspieces are laid on the longitudinal plates, then



filled with brush, and succeeding layers are put on as required. When the material is thoroughly dry, it may be evenly stored away in the barn or shed until a convenient opportunity occurs for stripping. I must again emphasise the advisability, when stacking away, for care in laying the broom-heads in symmetrical order—heads and butts in alternate layers—in order that, when stripping begins, the stuff will not need straightening out to enable the strippers to do the swiftest work. It is important to occasionally examine the interior of the heap to make sure that the curing has been efficiently done. Often the inexperienced grower will find that the condition of his fibre is different to what he expected. If any indications of heating or mould present themselves, then the evident plan is to once more spread out the parts affected. On the other hand, carefully dried material will give the grower no concern, as it will keep in bulk indefinitely—save for vermin. Properly cured corn, if of the evergreen varieties, should maintain its lustrous green shade after thorough drying; while the Californian Golden and White Italian sorts, if well handled and not affected with rust, should have a clear, bright appearance, as distinct from the clouded, dull presentment of fibre that has been indifferently looked after,

SCRAPING.

In the operation of removing the seed, many methods are employed—some very primitive, others involving more costly mechanical appliances. The selection of appliances for removing the seed will, to a material extent, depend upon the state of the crop when harvested. If the corn has been cut in the immature seed stage, then the appliances best fitted for broom corn in full seed will not be the most useful.

Growers of small areas or experimental plots may content themselves with such primitive appliances as may present themselves, such as a curry comb, saw-teeth, or a steel comb for drawing the fibre through. The most useful form of a primitive appliance that I have tried is the cleft stick, which is simple and effective for small lots. The method is to drive a stake into the ground, cleave the wood down the centre to a sufficient distance, put the broom-head in the cleft, draw it through, and at the same time with the left hand grasp the top of the stake to put such constriction on the cleft as is necessary to press the seed out.

This operation is rapidly performed, and, as a primitive method, is much in advance of any other I am acquainted with, and has the merit of being costless.

The mechanical appliances best adapted will depend upon whether the crop consists of ripened and fully formed seed-heads, or of heads in which little or no seed is matured. In the former case, an ordinary peg-drum thresher will be found most effective; while in the latter a saw-tooth cylinder scraper will be the most useful implement.

In cleaning brush on which the seed is formed, the process of cleaning is somewhat easier than when only the husks of green seed are to be dealt with. Thus a peg-drum thresher can be cheaply made, to drive by hand or power—the latter for preference—by either driving nails into narrow battens, leaving about one inch and a-half projecting, and then fastening the strips firmly on to a barrel or cylinder properly centred, and worked, if for hand, by spur gear, or, if by power, by a simple pulley arranged to give due speed.

If for treating immature brush, as is mostly the practice adopted by the American growers, who produce the highest-priced corn, the material must be scraped off by saw-teeth scrapers designed for the purpose. Of course, the peg drum will, to some extent, do for this class of brush; but it is a slower and harder task to remove the husks than if a properly constructed tooth-scraper is employed. In my own case I was fortunate enough in possessing an old cotton-gin that in my boyhood I had often helped to feed when cotton was king in West Moreton. From the numerous narrow oblong saws I constructed my scraper, by fastening them on to strips of inch-by-inch hardwood, and these on to a drum made from a pine log about 4 feet long. When working it by hand I put spur gear on, but usually fixed the pulley to drive by pony gear. The average farmer's ingenuity will not be heavily taxed to construct such a machine as is needed for either of these machines. The rough framework necessary to suspend the barrel can be easily formed from a few pieces of scantling well spiked together or, for preference, bolted on, as the vibration has a damaging effect on nails unless clinched. The speed at which the machine revolves also points to a necessity of the construction being sound. A strong guard and rest should be put up, so as to form some protection to the person holding the brush over the teeth. Sometimes, if handling crooked brush, the material will tangle in the teeth of the machine. Under such circumstances, it is better to let go rather than get a pull over the rough spikes or teeth.

In constructing the machine it is well to close the three sides up, either with bagging or boards, to prevent the dust blowing back as much as possible on the workers. Working with a drum such as I have described, giving room for two men or boys to hold the brush on, and one lad to hand up to them, the

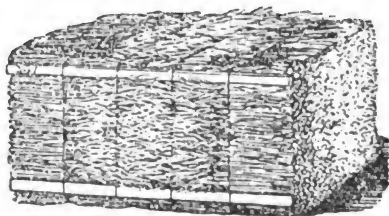
preparation can be quickly done. The cleaners, taking two handfuls of brush, press one handful down on the cylinder with the other, until clean and *vice versa*, turning the hand occasionally to ensure every part of the hold being scraped. In my own practice, I have cleaned at the rate of 40 lb. of brush per hour with one man at the machine and a boy to hand up.

Before concluding my references to cleaning the fibre, I wish to advert to a method that I sometimes used, and, as it has a bearing upon the curing of the crop, has some connection with the former subject. Under certain circumstances, it may be deemed expedient by the grower to strip the brush immediately upon cutting—that is, when the crop is not dried, but quite green. In such a case it is quite practical to do so, and with advantage in some respects. The fibre, stripped in this condition, will be much easier cured, and cured in better condition, inasmuch as the longer process of drying will be much accelerated by the absence of seed and husk on the fibre, and the whole residue much lighter and easier to handle. Where the grower cares to lose the value of his seed, this method can be used. If, however, he has need of the stripped seed for stock-feeding, the matter will not be wasted. Generally speaking, unless for converting into ensilage, for which I learn it is well adapted, green material such as this cannot be kept for long, as it quickly heats and ferments, and is wasted.

In addition to the implements mentioned, some farmers use portions of their stripping and threshing machines for the purpose of separating the seed. I think now that, as far as cultivation and curing are concerned, I have touched on all such points as are needed to guide the ordinary farmer who may be contemplating the cultivation of broom millet.

BALING.

The process of baling the fibre requires careful attention. The various qualities should be graded according to length. The long, medium, and the short should, as far as possible, be sorted out and kept distinct, and all crooked brush, if in quantity, should be kept separate. To bale the brush, the ordinary form of hay press is commonly used. The stalk of the brush is placed at the ends of the bale, allowing the tops to overlap in the centre, which tends to bind them. This is done by putting in an armful alternately from either end. In the case of short brush, it will be necessary to place some of fair length in the



centre occasionally, as the tops will not overlies sufficiently to hold the rest firmly in place. In baling care must be given to press the whole bale evenly and firmly, more especially for carriage to a distance. I frequently notice, on the wharves in Brisbane, American and New South Wales millet in broken condition, spread over the wharf and over the ship's hold, in consequence of defective baling. At all times, as far as baling is concerned, this crop is a hard one to handle, because the smoothness of the stalks makes it a matter of difficulty to fasten them tightly, either in small bundles, in bales, or when loading on the drays. The American bales, I notice, are fastened with ordinary fencing wire. The New South Wales crop is baled with the addition of strips of paling in the same manner as we put up lucerne hay.

These bales roughly measure about 4 feet in length by 2 feet 6 inches in width and depth, and weigh approximately between 300 and 400 lb.

Adverting to the general subject of broom corn cultivation, as indicated in these articles, there may be many points that are not touched upon. I have, as far as in my power, dealt with the practice I have always adopted in my own cultivation, the result of some experience. To those contemplating the growing of this crop, I would suggest that it is not one that will be found as congenial to produce as many crops I am acquainted with. The farmer who wishes to succeed must be prepared to give prompt attention to the many different operations involved, and to patiently put up with the most exasperating of personal discomforts consequent on carrying out the preparation of the crop. However, it is a rotation that for many reasons must commend itself to our farmers. I hope, in the near future, to note that not only shall our local factories be amply supplied with this material, but our surplus be largely exported to all the colonies of Australasia, thereby cutting out the imports of fibre from America and the large imports of manufactured brooms from that continent and from Italy.

CURING COW-PEA HAY.

ONE of the difficulties in connection with making cow-pea hay is the danger of losing most of, if not all, the leaves, which, with the exception, of course, of the pea itself, is the best part of the hay. Writing on this subject, a Florida farmer says:—

I find pea hay the easiest cured of anything in the hay line I have tried, and that, too, without the loss of a single leaf or pea. Take some little poles about 3 inches in diameter and 12 feet long; set them at convenient distances apart in the field and about 2 feet in the ground. Take two bits of board 2 feet long and 2 or 3 inches wide; nail them across the pole about 2 feet from the ground, crossing each other at right angles to hold the peas off the ground and allow the air to circulate freely under them. Cut your peas when dry, no matter whether the sky is clear or cloudy; and without waiting for them to wilt stack them around the pole on the boards, making the stack small in diameter—not more than 3 feet—and as high as you can reach with the fork. Place some crab-grass or anything that will shed rain on top; and your peas, rain or shine, will cure out as bright and sweet as can be.

In two or three weeks lift pole, peas and all, place them on the wagon, take them to the barn, slip the pole out and mow them away.

By stacking the peas before wilting they retain all the leaves and peas, and by lifting pole and all to cart them to the barn you do not disturb them, and do not rattle them off.

The vines being coarse, and the leaves thin, if the stack is kept small in diameter, no matter how wet the season is, the air circulates through them enough to cure the peas perfectly.

Where barn room is scarce, I have left them in the stack all winter, and though somewhat weather-stained, horses eat them with relish.

I think anyone who tries this method finds it so simple and effective that they raise pea hay because it is the easiest hay made if not because it is the best.

If the weather is rainy, when you commence your stack have a fork full of crab-grass handy, then cut peas and stack till a minute before the rain actually falls, then cover your partly built stack till the rain is over. As soon as the peas are dry enough to cut again, lay off your fork full of crab-grass and complete your stack.

STATE FARM EXHIBITS AT BOWEN PARK.

PROMINENT amongst the agricultural exhibits at the late Exhibition of the Queensland National Association, at Bowen Park, were the fine displays made by Mr. Ross, manager of the Hermitage State Farm, and Mr. Quodling, of the Westbrook establishment. These clearly demonstrated what can be done on good, bad, and indifferent soils by good farming.

WESTBROOK EXHIBITS.

Probably the most important feature of this exhibit was a collection of representative ears of wheat, comprising some 350 varieties, which were divided up and classed in the following groups:—Poulard, Poland, Blue Heron, Bailey, Ladoga, Port Germain, Japanese, Bearded Herrison, Winter Nigger, Lazislau, Bearded Indian, Bearded Velvet, White Velvet, Indian, Steinwedel, Purple Straw, Tuscan, Lammas, Essex, White Club, Noe, Fife, Defiance, Golden Drop, Square-Headed, Allora Spring, Ward's Prolific, Red Province, Rye Wheat, Tuscan Island, Shelton's, and Farrer's. The growing of these varieties and the selection of the "fittest," with subsequent tests and trials of the grain of each, under a system supplied with data, whereby a record of the climatological conditions affecting the development and growth of the plants, should prove of great importance to those interested in the advancement of this industry.

A portion of the wheats represented are made up by varieties which have been made, by judicious cross-fertilisation, to combine qualities for the resistance of rust and development of grain.

Under this heading a few words may not be misdirected to illustrate another branch in the improvement of the wheat industry which is carried on at the above farm, to test yields and development of plants and diseases under the following conditions:—

- Experiments with fertilisers.
- Experiments with different quantities of seed per acre.
- Experiments with different depths of sowing.
- Experiments with different periods of sowing.
- Experiments with different varieties (equal areas).

Some good samples of grain from field crops of the following varieties were noticeable, viz.:—Marshall's No. 3 and No. 8, Budd's Early, Improved Allora Spring.

MAIZE.—This class was well represented by some 24 varieties, conspicuous amongst them for marketable qualities being—Hawkesbury Champion, Macleay River, Early Mastadon, Sibley's Pride of the North, Hickory King, Waterloo, Sydney Red.

BARLEY.—Three varieties: Chevalier, Nepaul, Sea of Azov; the former possessing good malting qualities, while the latter, if grown for green feed, produce the best results.

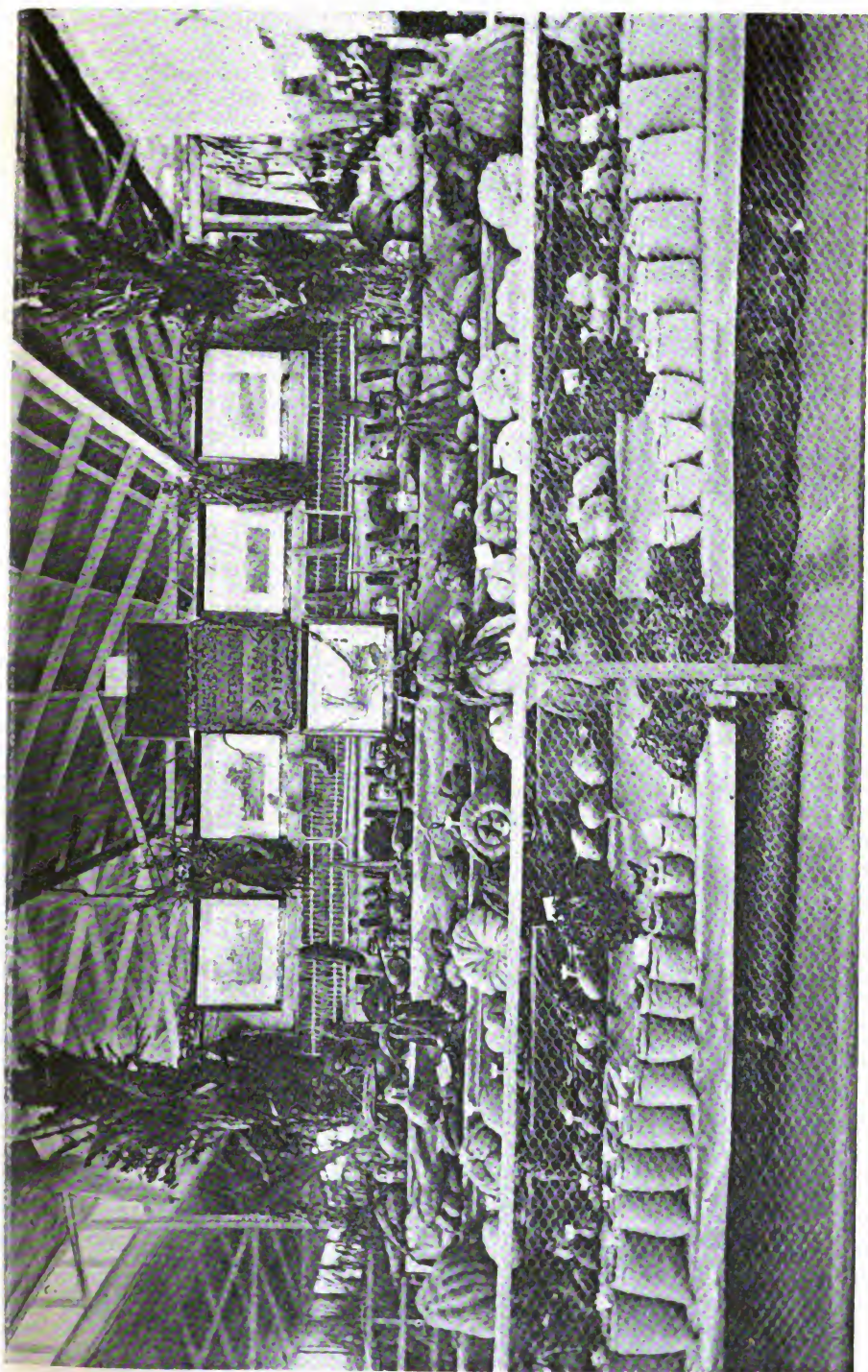
SORGHUMS.—The following varieties were represented by a bag of each, together with a sheaf taken from the crop:—*Sorghum saccharatum*, Planters' Friend, Amber Cane, Early Orange Cane, Egyptian Corn, Red Kafir Corn, White Kafir Corn, Broom Millet. The importance of growing such bulky food stuff as these supply cannot be over-estimated, when the long period from the end of summer to the beginning of spring has to be taken into consideration, when feed is dried up and useless for anything more than keeping a beast alive.

PANICUM.—A sheaf and sample bag of seed were shown, and these clearly demonstrated that this class of crop grows well on the Downs. It makes a quick-growing catch crop, but the seed should not be allowed to mature.

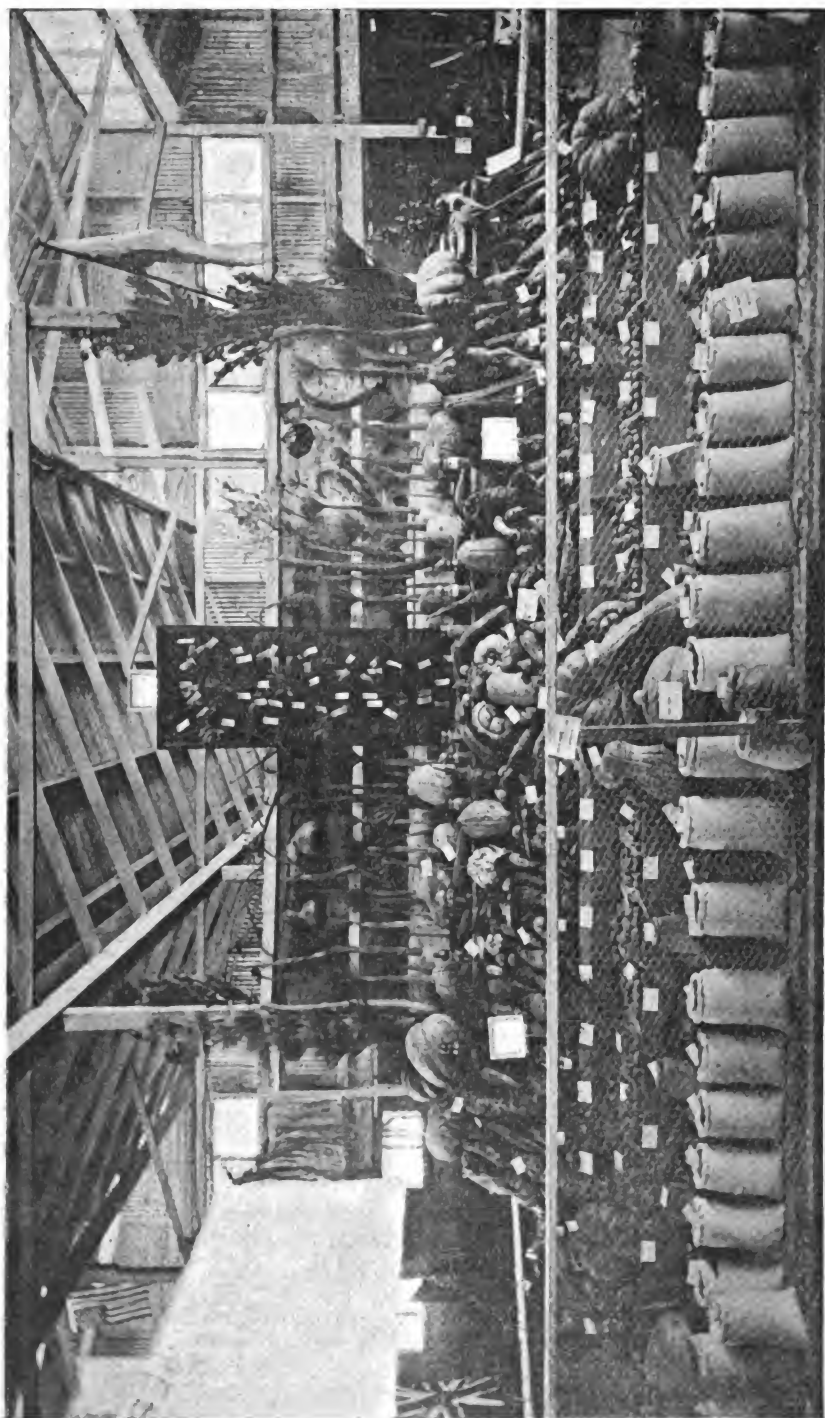
PEAS.—Several varieties of seed of good quality were exhibited. This crop should be more largely grown in conjunction with pig-raising.

BEANS.—A fair assortment of table varieties was noticeable, together with some kinds lately introduced—such as *Dolichos Lablab*, *D.L. (purpurea)*, Mauritius, Velvet, and Madagascar.

COW PEAS.—Four varieties: Black, Clay-coloured, Black-eye, Whip-poor-Will; the two former doing very well as a field crop. The value of this crop for green manuring and rotation has been demonstrated from time to time, as well as the value of the peas and chaffed haulms.

Plate CXXXIII.

STATE FARM EXHIBITS AT BOWEN PARK.—WESTBROOK.

Plate CXXXIV.

STATE FARM EXHIBITS AT BOWEN PARK.—THE HERMITAGE, WARWICK.

PUMPKINS.—Five varieties: Cattle, Crown, Ironbark, Button, and Japanese.

SQUASHES, &c.—Ten varieties.

POTATOES.—A very good sample of White Sweet potatoes was noticeable, reaching 16 lb. in weight. Eight varieties of English potatoes were benched, all demonstrating the qualities which make up a marketable potato—viz., uniformity in size, good keepers and boilers, with a minimum of waste.

ROOTS.—These included two varieties of Mangels and four of Beet-root (one of which was grown from seed introduced by Mr. Finucane from Greece). Swedes were of good quality and size. These, with beet and mangels, prove a great stand-by for different classes of stock during the winter. Table turnips were also of good size and quality, being represented by Purple-top, Stone, and Orange Jelly.

Other garden produce such as cabbage, spinach, lettuce, &c., was exhibited, all proving that these useful additions to the table should be more largely grown by farmers, who, with exceptions, neglect this branch to a certain extent.

TOBACCO.—Some excellent leaf of Burley was shown, put up in commercial-sized "hands," showing that the lighter classes of Downs soil will produce good leaf.

SALTBUSH.—Some well-grown plants of the Old Man variety were present. This excellent stand-by for stock in time of drought deserves to have more attention paid to it.

MISCELLANEOUS.—Sponge and Bottle Gourds and seed, Sunflower, Buck Wheat, Flax, Rape, &c. The latter crop thrives well, and, if grown once for stock feeding and as a green manuring and rotation crop, would continue to be grown. The excellence of the mutton produced from feeding a large percentage of rape is proverbial.

FOODSTUFFS.—The following meals were exhibited: Cob and Maize, Maize Wheaten (prepared from seconds), Sunflower, Cow Pea (seconds), and Linseed.

CHAFF.—Cow Pea, Lucerne, and Wheaten, both new and old, Red Clover, Vetches, Amber Cane, Kangaroo-grass.

SILAGE.—A box of Sweet Amber Cane was shown, taken from a stack weighted by means of the "Spanish windlass" system.

PRICKLY PEAR.—Plants of this pest were shown which had been treated with Dixon's Extremator, and they well demonstrated the efficacy of this treatment, leaves and roots being completely dried up and dead.

Samples of the different classes of soil to be found on the farm, together with subsoil, were noticeable.

Views of the house, stables, &c., were placed in conspicuous parts of exhibit in order to convey to the outsider some idea of the surroundings and objects of this institution.

THE HERMITAGE EXHIBITS.

We have obtained from Mr. C. Ross, the manager, the following particulars concerning the Hermitage exhibits:—In offering a few remarks on the collection exhibited at Bowen Park last month, I do not intend inflicting a categorical description of each individual product displayed, but to take a cursory view of the whole (noticing a subject here and there), as representing part of the result of operations carried out on the Hermitage State Farm for the past two years. Although all the exhibits were grown on the farm during the past few months, it would be unfair to discuss their merits without considering that the present results are the outcome of the initiatory work of breaking up and thorough cultivation the land had received during the previous

period. The exhibits, from an educational point of view, were highly satisfactory. For instance, the 400 varieties of wheat (which would require a whole volume to adequately describe) were quite a revelation to many who are interested in cereal culture. The distinctive character of each was made quite clear, so far as the full length of straw and ear is concerned, by being neatly mounted on a neutral coloured background, which set them off in bold relief.

Turning to the miscellaneous collection, the most prominent object (in the centre), as shown in the accompanying illustration, was a large frame, within which were mounted 84 varieties of natural and cultivated grasses. Perhaps the most attractive feature was the mass of specimens of enormous roots, such as mangel wurzels going over 40 lb. in weight, and carrots 2 feet 6 inches long; one mammoth specimen, shown on the left in the photograph by a ticket placed upon it, turned the scale at 10 lb. This was a White Belgian, solid and crisp to the core. It is astonishing that more of these crops are not grown, when 40 tons of mangels to the acre can be gathered off good land with ordinary cultivation. Most dairymen who have rationed their stock on this root say that nothing increases the flow of rich milk so well. Carrots also can be grown very profitably in a loose friable soil. Either of the above is quite independent of the weather when once through the ground. I may mention here that the horses on the farm have been fed lately almost exclusively on wheat-straw chaff, cow-pea chaff, and carrots. Comparatively speaking, very few people seem to know the value of these roots; some, in fact, do not know what they are. One funny remark I heard was: "Oh! look at the big radishes"—was it humour or ignorance?

Beneath these was shown an interesting assortment of 30 varieties of potatoes. These had been grown on land that would generally be considered by no means suitable, but by real good tilth and without the aid of manure it was made to produce a fair crop of marketable tubers from all the varieties; and from the following sorts, viz.:—Irish Flounder, Magnum Bonum, The Bruce, Breere's Peerless, Imperiater, &c., resulted first-class yields.

Pumpkins were represented by 10 varieties, ranging in size from the small blue-skinned "Crown" (table) to the large high-coloured "Premium." This latter is a very useful sort. Where a slicer or pulper is not available, it is the best pumpkin for "whole raw feeding"—a very heavy cropper, and will yield in a dry time, when others will fail.

Some large Grammas, Mexican Rios, and several squashes, cabbage, turnips, &c., are distributed through the group, and at the foot of these were placed rows of white canvas bags containing legumes in bulk, and many kinds of small seeds saved and cleaned on the farm. Here and there through the exhibit could be seen bottles also containing seeds and grains of rarer kinds.

A pretty pyramid of bearded wheats embellished the top left-hand corner, near to which might be seen a splendid specimen of the new Turkish vegetable marrow, 4 feet 6 inches long. (This novelty makes a splendid dish when cooked young.) The background was made up of other *Cucurbitæ*, interspersed with hands of wheats and heads of a new variety of Jerusalem corn, finishing off at the right with another pyramid composed of broom corn, millets, and cereals. A great quantity of many-coloured, fantastically-shaped, edible gourds were indiscriminately strewn all over the display, giving to the whole quite a lively effect.

The two pillars in the foreground (which do not appear in the picture) were utilised for showing the full-length specimens of sorghums, millets, canes, Kafir corns, &c., which were surrounded at the base with bags of chaff, including different straw chaffs, cow-pea chaffs, lucerne, &c. The products shown amounted to over 100.

Mr. Ross adds that he anticipates a good yield from potatoes this season; as they have been planted on better land, and there will be a fair quantity of good sorts for disposal, either made up into collections or in parcels of individual varieties. The first crop will be just the thing for Southern coast planting.

Mr. Soutter, Inspector of State Farms, adds the following particulars :—
The following exhibits came from the Hermitage State Farm, near Warwick (M. C. Ross, manager) :—

Thirty varieties of wheat in bags and bales, amongst which the best were Marshall's No. 3, Marshall's No. 8, Budd's Early, Cobb's Allora Spring.

Sample bags of Amber Cane; also whole plants.

Sample bags of Orange Cane; also whole plants.

Sample bags of Brown Douhra cane; also whole plants.

Sample bags of White Kafir corn; also whole plants.

Sample bags of Red Kafir corn; also whole plants.

Sample bags of Jerusalem corn; also whole plants.

Sample bags of cow pea; black and clay.

Sample bags of various sorts of peas and beans.

Sample bags of cow-pea chaff.

Sample bags of lucerne chaff.

Sample bags of wheaten chaff.

Sample bags of mixed chaff.

Twenty-five varieties of potatoes exhibited in boxes.

A large display of mangolds, sugar beet, field carrots, and turnips of various sorts; a large collection of marrows, pumpkins, squash, gourds, and fine samples of the Turkish cucumber about 4 feet long; cabbage and other vegetables were also in evidence. A collection of 408 varieties of wheats, mounted on screens, showed clearly all the wheats grown on the Hermitage Farm.

AGRICULTURAL COLLEGE EXHIBITS.

The products of the Queensland Agricultural College at Gatton were well represented, the exhibits being of excellent quality, well got up, and tastefully arranged. The farm, the market garden, the dairy and live stock were all represented, and were under the charge of two of the students, who carried out the work entrusted to them in a very complete manner. The dairy produce occupied a prominent position, and comprised over half-a-ton of well-made cheese and a large quantity of condensed milk and butter. These were shown in suitable tins, with neat labels, bearing the College brand. Several sides of bacon and some appetising-looking hams, cured at the College, were considered to be very good samples of pig-products. In connection with the dairy may be taken the two kinds of ensilage which were shown. One of these samples was taken from a stack, and the other from the silo building. Both were made from green maize, and were in excellent condition. Quantities of this valuable fodder are made at the College. Since the beginning of the year, some 327 tons have been "manufactured," if such a term is permissible with respect to ensilage, and the dairy cattle are exceedingly fond of it. As may be supposed, much attention is paid to artificial grasses and clovers. Of these there were shown, in small boxes, in which they had been placed some days prior to the exhibition, prairie-grass, several varieties of rye-grass, *Paspalum dilatatum*, and several kinds of clover. The vegetable garden of the College, which is superintended by Mr. Gorrie, is one of the show places which attract the visitor. Every variety of vegetable suited to the climate is produced here to perfection, and the students take a pride in keeping it up to highest pitch of intense cultivation. By means of irrigation, the crops are kept constantly growing, and being judiciously rotated the very best results are shown. This was very much in evidence in the splendid exhibits of garden produce, which included peas, beans, rhubarb, carrots, cabbage, sweet potatoes, beetroot, cauliflower, leeks, and various kinds of herbs. From the farm, which is managed on true farming principles by Mr. A. Watt, came several varieties of maize, pumpkins, squashes, potatoes, Kafir corn, swedes, mangel wurtzels, wheat, beans, and a variety of other farm produce. A sample of tobacco was also noticeable. The dairy cattle shown included 10 young bulls bred at the College, which comprised one Jersey, five Ayrshires, three South Coast, and one Holstein. These animals were all sold at the close of the Exhibition at prices which were considered satisfactory.

THE USE OF MOLASSES AS A FOOD FOR LIVE STOCK.

By DICKSON AND MALPEAUX.*

THE molasses used for the experiments contained—

- 46 per cent. sugar.
- 2·45 per cent. ash.
- 11·56 per cent. nitrogenous organic substance.
- 26·8 per cent. water.

In an experiment with butcher's sheep, two groups (as near alike as possible) of six sheep each were formed. One of the groups received for 20 days, per day and per head, 10 lb. of beetroot slices and 1½ lb. of cotton-seed meal; and the second group an additional 7 lb. of molasses, which was mixed 24 hours before being used with the slices and a little chaff. The animals liked the molasses, which produced no ill-effects whatever. The group of the sheep without molasses increased during the time of experiment 35·8 lb., and that of the other group 50·6 lb. After an intermediate period of three days, the food of one group was changed to the other group, and again continued for 20 days. In this case the increase of weight was 33·6 lb. in the group without molasses and 48·8 lb. in the group fed with molasses.

In a second series of a similar experiment with fattening sheep, the use of 8 lb. of the cotton-seed meal was replaced by 88 lb. of molasses. In 20 days the group of sheep (again six animals were used) fed with the molasses increased 40·2 lb., the other group 35·5 lb. During the next 20 days, in which the feeding of the groups was reversed, the group of molasses-fed sheep increased 40·6 lb., and the other 35·6 lb.

Four Yorkshire pigs out of the same litter were divided into two groups—the one receiving 11 lb. of boiled mashed potatoes, 4·4 lb. of a mixture of crushed rye and horse beans, and 22 lb. of fatty slops water. The second group received an additional 9 lb. of molasses. The molasses was mixed with the potatoes, and was greedily eaten by the pigs. The increase of weight during 40 days was, in the first group, 107 lb., and in the second group, fed with molasses, 123 lb. The same advantage of the molasses-fed pigs was shown during the next period of 40 days, during which the feeding of the groups was reversed, showing an increase of weight of 146 lb. and 162 lb. respectively.

Similar experiments were carried out with heifers 22 and 24 months old. The fodder consisted of 5·5 lb. of clover hay, 5·5 lb. of oaten straw, 35 lb. of sliced beets, and 1½ lb. of oil cake. A second group of two beasts received an additional 1½ lb. of molasses, which was mixed, 24 hours before being used, with the beet and water. The animals took easily to the molasses food.

The experimental periods of 20 days each, feed reversed in the second period, showed increases in weight for the groups fed with molasses of 78·3 lb., and 80·2 lb., the groups fed without molasses of 60·7 lb. and 52·3 lb. respectively.

In an experiment with 4 milking cows, fed with 5½ lb. of clover hay, 12 lb. of oaten straw, 110 lb. of sliced beets, and 4·4 lb. of oil cake during a period of 50 days—one group receiving an additional 2½ lb. of molasses per head and per day—the molasses food did not increase the quality or quantity of the milk, but the animals increased considerably in weight.

With four horses, fed with 15½ lb. of oats, 11 lb. of lucerne hay, and 11 lb. of wheat straw, part of the oats was gradually replaced by an equal weight of molasses. The change was made in such a manner that from the first day the quantity of oats was reduced by 66 lb., and from the sixth day by 22 lb. The molasses was given with the drinking water. The health, appearance, endurance

* *Annal. Agran.* 1898, vol. 21: Translated from "Biederman's Central Blatt für Agricultur Chemie," Mar. 1899, by T. C. Brünnich, Agricultural Chemist, Queensland Agricultural College.

and power, and coat of the horses so fed left nothing to be desired. In 40 days the horses fed with molasses showed a slight increase in weight. The saving in the cost of feeding was not a large one, but could evidently be considerably reduced.

Molasses deserves a consideration principally for the increase of feeding value, and for improving the taste of inferior fodders. Clover and meadow hay spoiled during harvesting, and refused by cattle, was liked by them, and considerably increased their weight, if the hay was chaffed, mixed with a little oat chaff, and saturated with diluted molasses (3 parts of water with 1 of molasses), and left for 24 hours to ferment.

QUEENSLAND AGRICULTURAL COLLEGE.

SINCE we last wrote describing the improvements at the above College, the work has been going on of enlarging and adding to the buildings, clearing, fencing, and placing more land under cultivation. The following account of what has been done in all these directions will doubtless be of interest to our readers:—

We may commence with the pulling down of the old stable and cowshed, the removal of the silos, and the completion of the new buildings which have been erected on plans submitted by the Principal some time ago. These fine buildings, for convenience and cleanliness, are unequalled in the colonies, and reflect great credit on the management for their superiority in these and other particulars.

The stables contain 20 stalls and 10 loose boxes, large and roomy. A cement floor with sufficient fall permits of the liquid manure passing into a cemented channel leading to a cesspit, on which a pump will be erected to facilitate cartage. The stable is open on both sides, and between the two rows of stalls are two walls, enclosing a long passage, down which a tramway is laid to convey the trucks with the fodder to the mangers. The latter are hinged feed boxes, revolving into the passage.

The horse feed is stored in a loft above the passage and extending its whole length. Two shutters—one near each end of the passage—convey the fodder to the trucks. This fodder may in quantity amount to 50 tons stored. It is admitted to the loft through two doors at both ends, where a spacious cartway is provided for each. On the one end the cartway passes between a harness and tool room, in process of erection; and the stable is on the other end.

The barn is spacious, and has a wood floor instead of the concrete.

The cowshed is built on the adjacent side of a square, and on equally convenient lines; with this difference, that the walls are on the exterior, light and ventilation being provided by sliding windows. Forty stalls are enclosed, 20 on each side; the intervening passage has a tramway, and the conveniences of the stable with suitable modifications providing for bails, &c. The channel for conveying the liquid manure from the stalls is about 5 feet distant from the latter, and also leads to a cesspit.

From the end of the harness-shed there will extend an implement-shed in a line parallel to the direction of the cowsheds, and—walled up to the north—will afford shelter to the many valuable implements required in an institution which is intended to be in every sense a model for the Queensland agriculturists and dairymen. From the splendid iron roof it is anticipated that a large quantity of water can be conserved, and an underground concrete tank will prove a valuable adjunct.

The timber of the old buildings has been utilised in various ways, and one in particular is worthy of mention. It consists of a small building situated at a convenient distance from the dairy, for the purpose of bacon-curing, under the special management of the Principal. This house is divided into three rooms, entrance to which is gained from one end. The first room, 10 by 10 feet, on the floor contains a brine tank divided into two compartments, having each a capacity sufficient for six pigs. The second room, 8 by 10 feet, is the drying-room, where a fan is erected for producing a rapid circulation of air. The third room, 8 by 10 feet, is the smoke-room, in which the bacon is subjected to fumigation prior to packing and placing away in dry salt and bran.

Some of the old buildings timber will reappear in the implement-shed referred to above, and in a blacksmith's shop adjoining.

FARM CROPS.

About 13 acres of grasses are just appearing above ground and growing well under the recent $\frac{1}{2}$ -inch of rain. Prairie-grass (*Bromus unioides*) and Cocksfoot (*Dactylis glomerata*) are both growing nicely. Rye-grass (*Lolium perenne*) is doing remarkably well. These grasses are planted in drills 12 inches apart with the "Champion" seed drill.

Hard Fescue (*Festuca duriuscula*) has germinated, but is not growing well. Creeping Bent-grass is not satisfactory. Kentucky Blue-grass (*Poa pratensis*) is just starting, and growing well. Timothy (*Phleum pratense*) is growing remarkably well.

About six acres of Field Peas (*Pisum sativum arvense*) and Vetches (*Vicia sativa*) are growing well.

Twelve acres of potatoes are looking healthy and clean. An experiment is being carried out in connection with this crop by planting with and without Jadoo Fibre.

A splendid crop of wheat mixed with Lucerne (*Medicago sativa*) is yielding about 10 tons of green stuff to the acre. The lucerne grows rapidly after the crop is cut. In this experiment only 16 lb. of wheat was sown to the acre, the result showing a high percentage of germination in the seed and production in the plant.

Beyond the orchard, crops of wheat and barley were sown to the extent of 70 acres. They promise good yields from newly broken-up land.

EXPERIMENTAL CROPS.

On the road passing through the estate to the Lockyer Creek may be seen a number of interesting experimental crops. The shallow and deep planting of Prairie-grass is very instructive—a marked contrast in favour of the latter is very noticeable; also the difference in the growth of broadcast and drilling is very much in favour of the latter. Cocksfoot is a fine healthy plant. Rye-grass looks remarkably well in spite of unfavourable conditions since sowing. A crop of malting barley is just saved by the timely rain. Nepal barley is not growing well. A plot of German and Egyptian lentils sown on the 20th July appears to be growing well.

Non Plus Ultra turnip radish is growing well, as also the French breakfast carrot.

The Altraingham carrot was sown later, and looks healthy.

In the mangel wurtzel plots it is evident that the Long Red is superior to the Yellow Globe.

That very fine onion, the Brown Spanish, is growing well.

A most interesting experiment is a plot of 15 drills of English malting barley obtained from the Hon. Geo. Graham, M.L.A., of Victoria, who recently paid a visit to the College. The seed, of fine quality, was planted 6 inches apart, resulting in a close-growing crop, showing as many as 20 stems to each plant.

A plot of mangolds—the Golden Tankard—is growing well.

Of the different varieties of turnip, the White Globe is particularly juicy and healthy.

EXPERIMENTAL WHEATS.

Interesting experiments in hybridising of wheats are to be commenced next week.

Out of 38 varieties, the following planted on the 23rd of May are available:—

| | | | |
|---------|--------------------|-----|-------------------------|
| 339 | Gayndah | 96 | Canning Downs |
| 196 | Frument's Ferenese | 126 | King's Jubilee |
| 363 | Farrer's | 298 | Indian D |
| 391 | Yandilla | 383 | Comeback |
| | Rattling Jack | 123 | Indian Z |
| | Steinwedel | 121 | Indian Z |
| F.I. 67 | Steinwedel | 4 | Mica |
| 377 | Maffra | 7 | Egyptian C ^a |
| 125 | Early Para | | Early Baart |
| | Indian Pearl | 122 | Indian F. |

Paspalum dilatatum is planted out from roots, and growing.

Marshall's No. 9 is planted on 25 acres in an adjoining field, and Marshall's No. 3 on 10 acres. An experiment in feeding down this crop, or part of it, has shown good results.

THE ORCHARD.

The orchard is in good condition. The strawberries are growing well after the rain. Of these the Marguerites have suffered considerably from leaf blight. They were sprayed with Bordeaux mixture.

The Pink's Prolific and Hautboy are not at all affected. Pruning of fruit trees has all been finished. Some of the peach-trees were affected with black aphid. Spraying with whale oil and black leaf extract of tobacco formed an interesting experiment for a number of students. As a result there will be a good crop of peaches. The figs are also looking well. There are a few apricots on the young trees, and a prospective crop of Japanese plums.

The citrus trees are coming into flower. Many of the grafts made by students are growing. The vines (trellised) are showing signs of life. Half an acre of asparagus has been planted as an experiment. It is just beginning to grow.

The sisal hemp fibre plant is growing well and requires no attention.

Several varieties of new climbing beans are just above ground.

There is a large supply of broad beans and a plot of beetroot under observation, the seed of which has been supplied from Southern Europe by Mr. Finucane. It includes five different varieties, all of which are doing well.

TREE PLANTING.

An avenue is planted from the College to the railway siding. The trees selected are the Oriental Plane (*Platanus orientalis*) and the Pepper-tree (*Schinus molle*).

A vineyard of two acres has been laid out near the Principal's house. These are under the supervision of Mr. Rainford, and an olivetum adjoining, of about two acres, under Mr. Voller.

STOCK.

Two mules, obtained from Buaraba Station, have taken kindly to work, and carry the mail, &c., to Gatton.

THE COLLEGE HERD.

RETURNS FROM 1ST JUNE TO 30TH JUNE, 1899.

| Name of Cow. | Breed. | Date of Calving. | Yield. | Butter Fat. Babcock Test. | Commercial Butter. | Remarks. |
|------------------|-----------------|------------------|--------|---------------------------|--------------------|-------------------------|
| | | | lb. | percent. | lb. | |
| Star ... | Grade ... | 17 Dec., 1898 | 599 | 3.6 | 24.15 | |
| Dairymaid ... | Holstein ... | 7 Feb., 1899 | 379 | 3.2 | 13.57 | |
| Ranger ... | Grade Shorthorn | 9 June " | 495 | 3.8 | 21.06 | |
| Roany ... | " " | 1 June " | 621 | 3.1 | 21.56 | |
| Rose ... | " " | 11 Feb. " | 588 | 3.9 | 25.68 | |
| Leopard ... | " " | 23 Nov., 1898 | 468 | 3.5 | 18.34 | |
| Polly ... | " " | — Oct. " | 486 | 3.6 | 19.58 | |
| Princess ... | " " | — Oct. " | 443 | 3.7 | 18.35 | |
| Trial ... | " " | — Sept. " | 356 | 3.7 | 14.75 | |
| Daisy ... | " " | 11 Nov. " | 56 | 4.1 | 2.56 | Dried off, 7-6-99 |
| Duchess ... | " " | — Oct. " | 132 | 3.5 | 5.17 | " 18-6-99 |
| Whiteflank ... | " " | 4 June, 1899 | 728 | 3.8 | 30.97 | |
| Biddy ... | " " | 18 May " | 747 | 3.7 | 30.94 | |
| Lady ... | " " | 6 April " | 532 | 3.4 | 20.24 | |
| Rusty ... | " " | — Oct., 1898 | 365 | 3.4 | 13.89 | |
| Gertie ... | " " | 3 June, 1899 | 721 | 3.4 | 27.45 | |
| Fansy ... | Devon ... | 7 Oct., 1898 | 375 | 3.8 | 15.96 | |
| Lucy ... | Grade Shorthorn | — Oct. " | 467 | 3.8 | 19.86 | |
| Laurel ... | " " | — Sept. " | 362 | 3.7 | 14.99 | |
| Peggy ... | " " | 15 Nov. " | 421 | 3.8 | 17.9 | |
| Ginger ... | " " | 23 Oct. " | 119 | 3.4 | 4.52 | Dried off, 17-6-99 |
| Fodge ... | " " | — Oct. " | 116 | 3.8 | 4.92 | " 15-6-99 |
| Jane ... | " " | — Oct. " | 119 | 3.9 | 5.19 | " 15-6-99 |
| Rosebud ... | Ayrshire ... | 13 April, 1899 | 473 | 3.7 | 19.6 | |
| Blink ... | " " | 23 April " | 603 | 3.9 | 26.33 | |
| Isabelle ... | " " | 2 June " | 583 | 3.6 | 23.49 | |
| Annie Laurie ... | " " | 12 June " | 486 | 3.9 | 21.22 | |
| Laverock ... | " " | 20 Sept., 1898 | 281 | 3.5 | 11.0 | |
| Lena ... | " " | 17 June, 1899 | 231 | 4.1 | 10.60 | |
| Leesome ... | " " | 12 Aug., 1898 | 365 | 3.5 | 14.3 | |
| Linnet ... | " " | 19 June, 1899 | 287 | 3.6 | 11.56 | |
| Ream ... | " " | 26 June " | 49 | 3.5 | 1.91 | |
| Opale ... | Jersey ... | 24 Feb. " | 345 | 4.8 | 18.54 | |
| Baroness ... | " " | 13 June " | 216 | 4.3 | 10.39 | |
| Effie ... | " " | 10 Feb. " | 437 | 4.1 | 20.05 | |
| Connie ... | " " | 18 Nov., 1898 | 354 | 4.2 | 16.64 | |
| Queenie ... | Shorthorn ... | 20 April, 1899 | 562 | 3.9 | 24.53 | Heifer, with first calf |
| Nestor ... | " " | 27 Feb. " | 452 | 3.8 | 19.23 | With first calf |
| Hilda ... | " " | 1 Mar. " | 358 | 3.8 | 15.23 | " " |
| Maggie ... | " " | 5 April " | 325 | 3.7 | 13.46 | " " |
| Glady ... | " " | 3 June " | 327 | 3.6 | 13.18 | " " |
| Plover ... | " " | 25 April " | 586 | 3.4 | 22.31 | " " |
| May ... | " " | 3 June " | 462 | 3.8 | 19.65 | " " |
| Louisa ... | " " | " " | 348 | 3.7 | 14.41 | " " |
| Fancy ... | South Coast ... | 7 May " | 583 | 4.1 | 26.76 | " " |
| Misery ... | " " | 4 May " | 513 | 3.0 | 17.23 | " " |
| Scarlet ... | " " | 17 Oct., 1898 | 173 | 3.8 | 7.35 | Dried off, 20-6-99 |

NOTE.—In addition to the natural grasses the dairy cows were fed on green Cape barley, which was fed to them both night and morning, the quantity consumed being at the rate of 52.5 lb. per head per day.

THE SUNFLOWER.

By HENRY A. TARDENT,
Manager of the Biggenden Experiment Farm.

THE Sunflower (*Helianthus annuus*) is a Composita. Its stem is cylindrical in form, full of a kind of soft pith, and reaches a height of from 6 to 12 feet. The leaves are alternate, broad, hairy, heart-shaped, and from 8 to 15 inches long. The flowers, with their golden yellow petals, are the very image of a radiating sun. Hence its name, and not, as some people think, because it always turns its face towards the sun, although the plant has a tendency to do

so. In larger varieties the flowers or heads, as they are called, reach sometimes 18 inches in diameter. When the seeds are ripe they are so thickly set that as many as 2,000 or 3,000 find place in a single head. These seeds are slightly wedge-shaped, and vary in colour, some being quite black, whilst others are grey or white streaked with black.

There are, of course, different varieties of the sunflower. The most profitable to grow is undoubtedly the Giant Russian, of which each head contains from 1,000 to 2,000 seeds. It is closely followed by the Black-seeded variety. The Small-seeded is distinguished by the great number of its flowers, which are very ornamental, though of much smaller size than in other varieties.

For certain countries, such as the United States of America and Russia, the sunflower occupies an important place in rural economy. But here, in Queensland, I do not think that its cultivation has ever been attempted on a commercial scale. It is, however, admirably adapted to our soil and climate. During the last 10 years, I have grown it successfully under a great variety of circumstances and seasons, and have found that it succeeded as well in the dry West: as on the Downs and here, further north, at Biggenden. Its cultivation is also very simple. The best land for it is on deep, well-drained loam, such as is to be found on the banks of our rivers and in our scrubs. It does also well on forest lands which are not too sticky. The land should be worked deeply and well pulverised by the implements and means indicated in my previous article on Maize (*Q.A.J.* Dec. 1898).

The sunflower takes its origin from Central America, and is, in consequence, sensitive to frost. It cannot, therefore, be sown before the late spring frosts are over. The best time is from September to February inclusive. For larger varieties, the rows should be from 2 feet 6 inches to 3 feet apart, and the seed from 10 to 18 inches apart in the row. In that way, from 4 to 5 lb. will be sufficient to sow an acre, and the return may be fairly estimated as from 40 to 50 bushels per acre. It grows rapidly, the crop being usually ready for harvest in three months. A very expeditious way to harvest it is to cut the stem close to the ground by means of the horse corn-cutter described in the above-quoted article, and then to cart home stems and heads together. If such an implement is not available, then the work, though much slower, can be done with a sharp reaping-hook or a long knife. The heads should be then dried as quickly as possible, so as to avoid the formation of mouldiness in their fleshy parts and on the seeds; as soon as dry enough, they can be threshed, winnowed, and bagged.

During the growth the cultivation consists in keeping the land clean and well pulverised, so as to break the capillary pores of the soil and thus keep the moisture in the ground. This is a very important point, as the sunflower is one of the greatest known evaporisers of moisture. When the plant is full grown it will evaporate from $1\frac{1}{2}$ to 2 lb. of water in 24 hours. As evaporation is always accompanied by the production of cold, it follows that the sunflower is, as well as the banana, a good plant to grow near dairies and other places which require to be kept cool. It is also sometimes planted along marshes to evaporate the moisture and purify the air. The sunflower is, of course, mostly grown for its seeds, which are very nutritious and contain a large quantity of oil. In Russia, where I have seen thousands of acres under that crop, the yield of oil is estimated at from 40 to 50 per cent. of the total weight of the seed. It is in reality much more, but in the process of extraction an important proportion of the oil remains, unfortunately, in the shelly seed envelopes. The oil, though not quite as good as that of the olive and earth-nut, is largely used for salad and cooking purposes. It is usually of a nice straw-yellow colour, sweet and pleasant to the taste. It, however, soon becomes turbid, and solidifies at 16 degrees F. It burns well in the lamp, and is, in addition, largely used in many industries such as in painting, candle and soap manufacture, &c. In Russia enormous quantities of the seeds are consumed by the children and also by adults of the peasant class. They roast them like coffee-beans, crack off the husks, and eat the oily and savoury kernels, which

form no doubt a most healthy and pleasant food. There is really no complete feast or holy day for a country lass or youth without a few pennyworth of the dainty *Sémotchky*.

These sunflower seeds form also a capital feed for poultry, being nearly equal to buckwheat to induce hens to lay. Pigs also like them, and thrive well on them. The oil cake (*tourteau*) which remains after the extraction of the oil is, for feeding and manurial purposes, as valuable as linseed and cotton-seed cake. In those vast plains or steppes of Russia, where timber is scarce, the sunflower stalks are used as fuel. As their ash is very rich in potash, the latter is carefully collected and sold. Such ashes form, of course, a capital manure and stimulant for plants requiring potash, such as tobacco, coffee shrubs, &c. Like the hemp, which they resemble, the stems of the sunflower are surrounded by a valuable fibre, strong and silky. That fibre can be extracted and treated by means similar to those used for hemp and linseed. The pith of the stem is rich in nitre, which causes it to retain fire like tinder or a cigar, so that in case of snake-bite, for instance, it could be used as a cautery. When soaked in alum the seeds yield a nice blue colour, and from the flowers themselves a nice yellow colour is obtained.

The large leaves form an excellent green feed, greatly relished by all stock. They can also be used as ensilage and hay, but they should not be gathered too dry, as they easily crumble into dust; neither must they be too moist, as mouldiness would be the result.

The sunflower is also a grand bee food. At least the bees think so, for as soon as the heads come into blossom we can see scores of the busy workers occupied in loading their little thigh baskets with pollen and filling their tiny stomachs with the sweet nectar, and then fly to the hive where they will make of it bee bread, honey, or wax. In "Bee Gleanings," Dr. Hitchcock says that, after he had taken off the seeds from the heads, he would use these latter as bee troughs, filling the little cells with feeding syrup, which plan, he says, worked admirably.

Although I have by no means exhausted the numerous uses of the sunflower, I hope I have said enough to induce every farmer to grow a small patch on his farm. It will certainly be utilised under one form or another, and thus add to the general comfort of the inhabitants of the farm. Some district will be found far more suitable for its cultivation than others, and so a new industry may be gradually developed there.

MARKET GARDENING, No. 8.

By H. W. GORRIE,
Horticulturist, Queensland Agricultural College.

RHUBARB (*RHEUM RHAPONTICUM*).

THE rhubarb of the garden is a hybrid between *R. rhaponticum*, and *R. hybridum*, both of which plants are natives of the temperate regions of Western Asia. Rhubarb was first introduced to England in 1778, and came very rapidly into favour, so that nowadays no garden, however small, is considered complete without a bed of this most useful plant. Besides being utilised for pies, puddings, tarts, &c., a very good and cheap jam may be made from rhubarb.

For family use, I hardly know of a plant which better repays a little care and attention than the "pie plant," as it is called in America.

Rhubarb may be grown in almost any well-drained soil, but a rich deep loam yields the best product. The soil must be both rich and deep, and the deeper it is the quicker will be the growth.

The bed ought to be trenched to a depth of 2 feet, and very heavily manured with good stable and cowyard manure.

To grow the plants from seeds, a well-manured seed bed should be prepared, and the seed sown in August or September in drills about 1 foot apart. The young plants will require plenty of water in dry weather, and a light shade will also be beneficial to their growth.

Thin out the plants to about 6 inches apart, and let them remain in the seed-bed until the following spring, when they can be transferred to the permanent ground. The rows should not be less than 4 feet apart, and the plants at least 3 feet apart in the rows. During the first year the space between the rows may be utilised for growing lettuce or any other low-growing vegetables, but after that the plants will require the whole of the room for their full development. The ground should be kept well cultivated and free from weeds, and all flower-stalks should be cut off as soon as they appear, in order that the plants may not exhaust themselves by forming seed.

In the winter of each year a heavy top-dressing of coarse manure should be applied, and this must be carefully forked in in the spring, care being taken that the roots are not broken or disturbed in any way. No stalks should be used until the second year, and if left until the third the plants will be all the better.

No plant responds more liberally to judicious watering than rhubarb, and in dry weather irrigation gives surprising results in the way of increased yield and general vigour of the plants.

Water should be liberally used when necessary, but at the same time it is not well to overdo it and make the ground sodden. Liquid manure, applied occasionally, is also of great benefit.

Instead of raising the plants from seed, which is a rather slow process, it is often more convenient to plant crowns—that is, plants—one, or preferably two years old. These, planted in the same manner as the seedlings when set out in permanent beds, come on very quickly. Such crowns, if planted in July or August, begin to grow at once, and in September the stalks from them are ready for use.

By purchasing crowns, therefore, you can have rhubarb fit to use in two months instead of having to wait two years for seedlings to come to maturity. It will be found more profitable to purchase strong sturdy crowns, and renew them every third year, than to go to the trouble of raising seedlings which will probably not be very strong or vigorous, especially in the warmer districts of the colony.

Good imported crowns are rather expensive, but I think the expense is more than repaid in quickness and thriftiness of growth. Varieties which succeed well here are Joppa New Winter, Myatt's Victoria, and Giant.

VALUE OF PUMPKINS.

At the Hawkesbury Agricultural College, New South Wales, $\frac{1}{4}$ acres of poor soil were planted last year with 40 different varieties of pumpkins, and the following was the result:—

| | £ | s. | d. |
|---|-----|----|----|
| Cost of ploughing, discing, harrowing, rolling, manuring, striking out drills, working holes, seed, and after cultivation ... | 7 | 13 | 6 |
| Harvesting and carting to station ... | 5 | 17 | 6 |
| Freight | 9 | 10 | 4 |
| | £23 | 1 | 4 |
| Value of pumpkins sold—net return ... | 42 | 18 | 0 |
| Less cost of crop | 23 | 1 | 4 |
| Profit on the $\frac{1}{4}$ acres | £19 | 16 | 8 |

The pumpkins varied in weight from 1 lb. to 124 lb. each. The plot was sown in October, and the first ripe fruit was pulled on 19th January. When the crop was harvested the land was prepared for lucerne.

PRESERVING MELONS.

At the same time 1 acre of poor soil was sown with preserving melons. The drills were drawn 14 feet apart, and two seeds were dropped in holes at distances of 6 feet. The holes were not worked, as in the case of the pumpkins, as it was not considered necessary. The result was:—

| | £ | s. | d. |
|--|-------|----|----|
| Ploughing, sowing, harrowing, rolling, &c. ... | 1 | 7 | 6 |
| Harvesting and carting to station—33 tons | | | |
| at 2s. | 3 | 6 | 0 |
| Freight | 6 | 12 | 0 |
| | <hr/> | | |
| | £11 | 5 | 6 |
| | <hr/> | | |
| Cash received for 33 tons at 18s. | 29 | 14 | 0 |
| Less cost of crop | 11 | 5 | 6 |
| | <hr/> | | |
| Profit per acre | £18 | 8 | 6 |

From this it would appear that it would pay a farmer well to grow a few acres of preserving or pie melons, as they are called in this colony. But, as a matter of fact, such a crop would not pay for carriage here. They may be seen rotting in many fields, simply because it will not pay the farmer to send them to market. It is true that at times there is a certain demand for them at a fair price, and last year a quantity was imported from the south. We know that from £4 10s. to £6 per ton has been paid of late, but it does not follow that such is a usual price, or even that a market at any price could be found if large quantities were brought in. The railway freight on melons is 13s. 9d. per ton for 100 miles in full trucks, and 2s. 6d. for ten miles. With the price at £4. or even £3 per ton, there would appear to be a great deal of money in preserving melons when, as has been shown, 33 tons can be grown per acre. But it stands to reason that such an enormous profit is delusive, and could only be made on a very small quantity, and then only when the market is bare of such produce. At present the price of pie melons is 30s. per ton, and the demand is not excessive.

THE PRINCIPLES OF SHEEP-BREEDING.

No. 4.

ANIMAL HAIR GENERALLY.

By J. S. HERMANN SCHMIDT.

THE most important products of the skin, however, and the most interesting to the woolgrower, are those horny elements called hair or wool. The various kinds of hairy covering of the skin might be divided into feathers, bristles, hair properly speaking, and wool hair. I purposely avoid here the term "wool fibre," because it is liable to mislead those uninitiated. Fibres are fine slender products of the animal and vegetable kingdom, the result of certain changes and combinations of primitive cells, and constitute whole tissues. A single wool hair, however, being composed of fibres, cannot well be called a fibre itself. Wool is therefore a fine, tender, animal hair, the product of the skin. The wool and the down of sheep, goats, and some fur-bearing animals, as well as the fine downy hair of the human body, belong all to the same class. We shall see directly in what respect they differ from hair properly speaking. The history of the origin and the development of hair and wool have been made the subject of extensive inquiry. Cuvier has found that the elements of every hair which the skin is likely to produce are fully developed during the foetal (intra-uterine) existence of the animal—i.e., before it is born. This discovery is of the greatest interest to the woolgrower. We know at present that the skin of every individual will

produce no fresh hair bulbs after the animal is born. Every hair root that is likely to come to maturity and produce a healthy hair has been formed at an early period. It is hence impossible to increase the dense growth of the wool fibre, or, in other words, the numerical proportion of them to the square inch, by good feeding. Plentiful nourishment will tender to foster the growth of each existing hair, but it does not produce new hair bulbs. Density of growth is, therefore, a peculiarity of the race, a result of breeding, not of feeding. Bischoff has confirmed Cuvier's statement, and he has given some valuable information about the change of primitive cells of the epiderm and the cutis into the so-called hair bulbs. Bischoff's observations were chiefly made on embryos of rabbits, and Reissner finally collected, compared, and sifted all the information that could be obtained. He describes the origin of the hair as follows:—As soon as the embryo has so far developed that we can clearly distinguish the epiderm from the cutis, both begin to thicken at the same place.

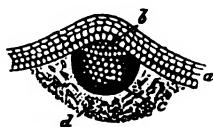


FIRST STAGE OF DEVELOPMENT—

- a. Undifferentiated epiderm.
- b. Hill-shaped accumulation of epidermal cells.
- c. Corion or dermis.

SECOND STAGE—

- a. Undifferentiated epiderm.
- b. Increased growth of epiderm and first formation of process or apophysis of epiderm.
- c. Globular accumulation of dermis papillæ.
- d. Corion or dermis.



The cutis recedes and the epiderm sends forward a slender column of cells, which forms the sheath of the future hair.

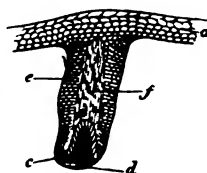


THIRD STAGE—

- a. Cuticle.
- b. Corion or dermis.
- c. Papilla.

FOURTH STAGE—

- e. f. Cylindrical apophysis or process of epiderm.
- c. The external portion will be changed into a sheath for the hair.
- f. The internal portion is light-coloured; the external portions of it will form the inner part of the sheath, and the central parts will be changed into the hair-shaft.
- c. Papilla.
- d. Part of bulb.



At the place where this process from the epiderm reaches the cutis, the cells of both epiderm and cutis combine and form a small conic body—the hair bulb.

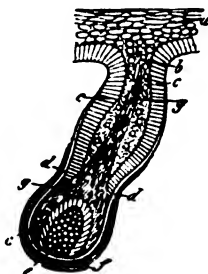


FIRST DEVELOPMENT OF THE HAIR-SHAFT AND ITS SHEATH—

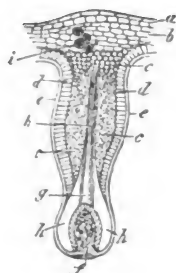
- a. Central cells.
- b. Layer of cylindrical cells of the process of the epiderm.
- c. Basement membrane.
- d. Papilla.
- e. New cells of the papilla destined for the formation of the hair.

FURTHER DEVELOPMENT OF HAIR-SHAFT AND SHEATH—

- a. Differentiated epiderm.
- b. Central contents.
- c. Layer of cylindrical cells of process or apophysis of epiderm.
- d. Basement membrane.
- e. Papilla.
- f. Beginning of the formation of internal fibrous membrane.
- g. Central cone, not yet differentiated into hair-shaft and its sheath.



The process of increasing the cells newly formed in this way continues, the earliest formed cells are pushed upwards through the column of epidermal cells that protrudes downwards, and the hair so formed pushes itself finally through the epiderm as a finally developed hair shaft, in which we observe three parts—



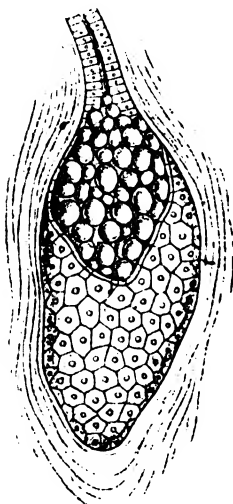
DIFFERENTIATION OF HAIR-SHAFT AND SHEATH.

- a. Horny layer.
- b. Mucous membrane.
- c. Central cellular contents.
- d. Layer of cylindrical cells of process.
- e. Basement membrane.
- f. Papilla.
- g. Small light-coloured cone representing the first stage of differentiation of the shaft of the hair and its sheath (h).
- i. Fat globules.
- k. Origin of the sebaceous gland.

Firstly, the outer covering or epiderm; the next portion called the cortical layer; and thirdly, the central channel or medullary substance.

Beginning at the surface, we find that the covering of the hair—the epiderm—is made up of a thin coat of flattened cells which the hair carried up with it from the lower and softer portion of the epiderm, or Malpighian mucus. Having firmly adhered to the hair shaft, having gradually been pushed up through the narrow opening in the skin, and being then exposed to the influence of atmosphere, this coat of originally slimy or mucous cells became more firm and tough, thus forming a strong coat that can only be removed through the use of strong chemicals. The microscope shows us the epiderm of the hair shaft as a pretty regular layer of flattened scales not unlike the tiles on a roof. (Plate CXXXV.)

Before the young hair has penetrated the epiderm and reached the outside, some of the epidermal cells, situated along the shaft, have greatly increased in size and become modified until they have changed into glands, which produce a fatty substance called the “yolk” of the wool.



FULLY DEVELOPED SEBACEOUS GLAND.

The fat, or yolk, here prepared passes, by means of a duct, to the inner surface of the sheath, and serves to cover the young hair with a coat of grease. This, in

combination with the sweat or fluid perspiration, forms a kind of soap, the yolk properly speaking, a subject about which more will be said later on. I shall now speak about hair and wool in their natural condition as the products of the skin.

We have seen that all kinds of hairs grow from the hair bulb or papilla. Some kinds of hair live for a short period only, and then drop off. After this the hair-bulb produces a new hair. This is a phenomenon similar to moulting, with that difference that, whilst the latter takes place periodically, according to the seasons, the falling off of matured hairs and the growth of young ones, does not always depend upon the season, but upon a peculiar constitution of the different kinds of hair in question. Horses, for instance, shed their summer and their winter coats periodically; but their eyelashes, the hairs of their manes undergo a more gradual process all the year round. The hair of the tail of horses, however, does not moult in the sense of a periodical change, but grows on without interruption so long as the animal is in good health and condition. An experiment, consisting in combing and otherwise carefully preserving the tail of a horse, resulted in a growth of several yards in length. Merino wool, if allowed to grow, will also attain a very considerable length. I have seen samples of fine merino wool of several feet in length. Bohm mentions the wool sample of a fine-woolled Electoral sheep that had not been shorn for 10 years, and the staple of which was 25 centimetres long.

All animal hairs—bristles, &c., included—originate and develop alike. The hairs, including the wool of our domestic sheep, are composed of two or three different parts—1. The outer coating or the cuticle of the hair. 2. The cortical substance. 3. The marrow or medulla.

The cuticle consists of a layer of scales, which are nothing but epidermal cells turned into horn. They cover the hair closely, surrounding it like more or less perfect rings, and overlapping each other, so that the surface of the hair has the appearance of a shingled or tile-covered roof. It is important to notice that these epidermal scales merely form a thin coating round the shaft of the hair, and that they are not protrusions of the hair substance itself.

The first description of the external structure of the wool fibre which we possess came from the father of microscopic inquiries, the Dutchman Loewenhöck. The microscope not being known to him at first, he was obliged to make use in his inquiries of a number of small globes manufactured by himself out of glass, and it is not to be wondered at that he described the wool fibre as a vegetable product of the skin, with hooks and branches. The optical delusions through which Loewenhöck was deceived caused also the great veterinary Youatt to fall into the same error, and I must quote Youatt's own words in order to refute a statement which, if adopted as being correct, must prevent us from recognising in its fullest importance one of the most valued qualities of the wool—namely, the felting property; a peculiarity to which I shall have to refer more fully on a later occasion. Youatt describes the wool fibre in these words: "The edges were evidently hooked, or, more properly, serrated; they resembled the teeth of a fine saw." And in another place, "These serrations were not so marked as the inverted cones which the bat's wool presented, but they were distinct enough, and the apex of the superior one, yet comparatively little diminished in bulk, was received into the excavated base of the one immediately beneath, while the edge of this base, formed into a cup-like shape, projected, and had a serrated or indented edge bearing no indistinct resemblance to the ancient crown."

Anybody that will take the trouble to examine under the microscope a number of wool fibres will find, provided that perfectly well-washed specimens are selected so as to avoid the adherence of yolk, or dust, &c., that Youatt's description is very much exaggerated, and that he has been led away by the idea that "his serrated edge" is "the only mode by which those properties of wool on which some of its value chiefly depends—the felting property—can be

thoroughly ascertained," or, in other words, that the serrated edge, and the indentations in the margins of the scales which form that edge, are the only cause to which the felting property of the wool is to be ascribed. Youatt was cautioned at the time by an optician of note against allowing himself to be carried away by his enthusiasm in exaggerating the form of the epiderm and overrating the importance of it. That gentleman wrote to him: "There is no appearance whatever of indentations upon the edges, and the only difference I found was that the markings we observed upon the surface were more distinctly made out, and had more the wavy appearance than before. I am satisfied the hair is round and cylindrical." Most thorough investigations by means of the microscope, made by the ablest men of the age, all coincide in the opinion that the wool fibre has no hooks, branches, or a feathered edge, and that the margins of the epidermal scales do not protrude to such a degree as to give the whole a strongly serrated look.

The cortical substance is situated immediately under the cuticle, and it makes up the body of the hair shaft. It is composed of small spindle-shaped cells which have completely turned into horn substance. They are round, elliptic, or flat, and they are placed in concentric layers round the longitudinal axis of the hair. In young hairs they run out in a pointed end, and the hair, of which the point has been cut off, will always remain blunt. After diseases, however, and other circumstances which made the hair come off, the new shaft reappears with a pointed top. In Todd and Bowman's "Physiological Anatomy" we find the following description:—

The shaft is produced by the rather abrupt condensation and elongation into hard fibres of the cells. These fibres may be demonstrated by simply crushing small fragments of the hair, but they become more conspicuous when the tissue is softened by a strong acid.

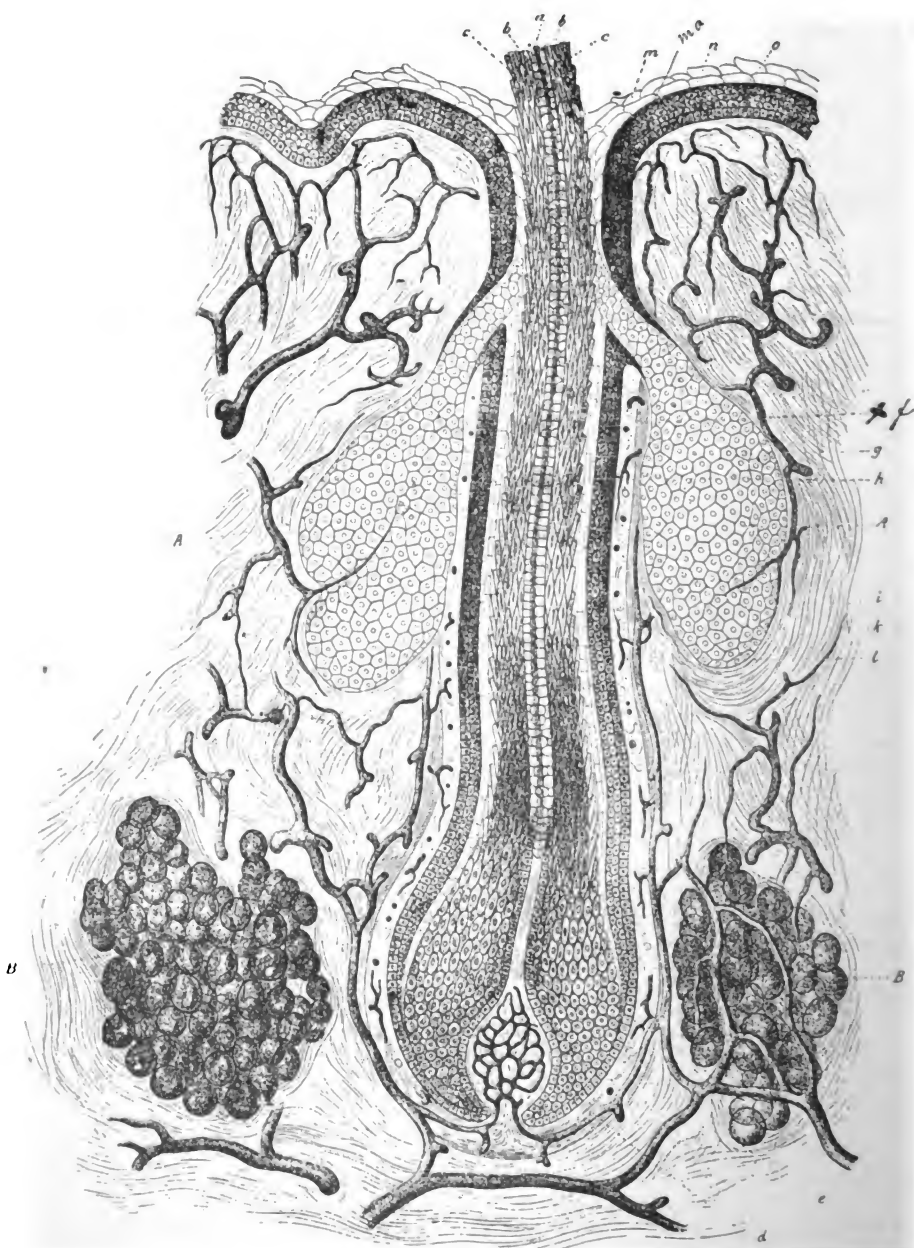
The several kinds of hair and wool greatly differ in colour, which is principally the result of the quantity of pigment distributed throughout the cortical substance. It has the form of either granules, of which several are united into small heaps, or of a colouring fluid which pervades the cortical substance from one end to the other.

The granules of pigment assume a linear arrangement between the fibres which are firmly united into a solid rod by a material similar, it may be supposed, to that which cements the scales of the cuticle.

The absence of pigment cells imparts to the hair or wool a more or less white appearance.

The white colour of the hair varies from a glassy, semi-transparent hue to that of the whitest china. Some wools have a silvery shimmer. This, however, cannot be accounted for simply through the absence of any kind of pigment, but through the peculiarity of the cortical cells themselves.

The Medullary Substance.—This substance is situated in the centre of the hair, and consists of cells which have kept more or less the characteristics of the original cell. The medullary cells are either filled with air or conglomerated into more solid layers, which are surrounded by air; some of them have nuclei and granules of pigment. The medullary substance is of a more or less porous nature, while the cortical substance is far more solid and firm. All coarser kinds of hair have a medullary substance, which can easily be seen on the bristles of pigs, white hairs of the human head, &c. There is no medullary substance in real wool hairs, such as the wool of sheep, the down of goats, &c., and the essential difference between hair and wool may thus be defined as consisting in the presence of a medullary substance in the former and the perfect solidity of the latter. It is evident that the peculiar construction of the wool fibre accounts sufficiently for many of its valuable qualities, and we apply, according to the foregoing explanation, the name "wool" to that class of animal hairs which have no medullary substance; such may be fine or coarse, long or short, straight or waved.

Plate CXXXV.

Diametrical Cut of the Skin with a longitudinal section of a sheep's hair having a medullary channel.

DESCRIPTION OF PLATE.

Diametrical cut of the skin with a longitudinal section of the root of a sheep's hair having a medullary channel—

- a. The medullary channel. The dark streaks represent the process of the papilla.
- b. Cortical layer building itself up out of the round cells, containing nuclei, which higher up assume more lengthened shapes.
- c. The cuticle of the hair, consisting of epithelial lamellæ placed above each other like tiles or shingles.
- d. The hair papilla and its vessels.
- e. Process of the hair papilla.
- f. Cuticle of the inner root sheath.
- g. Huxley's layer of the inner root sheath.
- h. The outer layer (Henle's) of the inner root sheath.

The external root sheath—

- i. The inner layer of the same.
- k. The outer cylinder of the same.
- l. The hair bulb, or root.
- m. The horny layer of the cuticle.
- na. The mucous layer of cuticle.
- n. The upper roundish cells containing nuclei.
- o. The deeper cylindrical layer of cells.
- A. Sebaceous glands.
- BB. Fat cells.

REMARK.—Some of the plates have been taken from Bohm.

THE WOOL INDUSTRY FROM A BUYER'S STANDPOINT.

By F. E. STURMFELS.

It is doubtful whether any textile varies more in grade, fineness, and condition than wool. Breeding from different types alters the fibre, according to whether coarse, medium, or fine grades are required by the breeder, but climatic influences are, to a great extent, responsible for many variations in the degree of fineness of wool; and while the former has a permanent effect on the fibre, the latter varies the quality, fineness, and condition each season, so that we may confidently say that no two consecutive clips resemble one another, though the breed may easily be detected, and we shall therefore have to consider the seasons when we come to the subject of woolclassing.

It is not the object of this article to treat in any way with the breeding of sheep, as our large woolgrowers are generally *au fait* on this subject.

The production of merino wool in Australia represents the largest exports from the colonies; and to enable us to deal advantageously with such an important article, we must naturally be able to place it on the market for sale in such a condition as will ensure the best results. It will, therefore, be our object in succeeding articles to deal principally with the judicious classing of wool.

Within the past twelve years the number of grazing farms and small holdings in this colony has been on the increase, and the owners do not always find it expedient or practicable to secure the services of experienced woolclassers; therefore our endeavour may prove of more service to small growers than to large station owners.

Through the experience gained in past years, large squatters have found it necessary to devote more attention to the classing and skirting of the fleeces, so that their work now practically amounts to good sorting. Most of the wools which are well classed now, as a rule, go direct into the machines without a further handling, to be turned into carded or combed wool according to the requirements of the purchaser. It is, therefore, obvious that the buyer can pay more for well-classed wools than for those which have been imperfectly classed and badly skirted, without mentioning such wools which have neither been classed nor skirted, as in these cases the wool must be sorted at home, and this means time and money which can quite as easily be earned in the colony.

We are perfectly aware that many of late have gone into woolgrowing who well understand the management of sheep, but who, when shearing-time comes on, are quite at a loss to know how to deal with the fleece. It is the intention of the writer, therefore, in the following pages to point out what should be done in the matter of classing and what should be avoided; and if it should result, from a perusal of these articles, that small growers become impressed with the necessity of paying due attention to this very important matter, he will feel his efforts have not been in vain.

Our subject will comprise, from a buyer's point of view—

- 1st. Classing of combing and clothing and their different grades.
- 2nd. Skirting of the fleece and their respective grades, and how far to skirt.
- 3rd. Scouring; when, what, and how to scour.

AGRICULTURAL SOCIETIES AND PLOUGHING MATCHES.

At the late ploughing match at Harrisville, the Minister for Agriculture (the Hon. J. V. Chataway) made some remarks, *inter alia*, on ploughing matches which were highly approved of by the farmers present. Mr. John Fielding, secretary of the Lockyer Agricultural and Industrial Society, Blenheim, writes:—"We were very much pleased with the remarks of the Minister for Agriculture at the late Harrisville ploughing match, especially in his advocacy of the principle of these matches being held under the auspices of existing agricultural societies. It shows that he has been giving the matter some thought, and that he realises the cause of the comparative failure of our agricultural societies to do the full amount of their legitimate work. Mere theorists in agriculture, and men, especially townsmen, cannot, be they ever so honest or enthusiastic, build up or carry on for any length of time a successful agricultural society."

Dairying.

HOW TO PASTEURISE MILK.

THE *Town and Country Journal* lately published the following method of pasteurising milk:—The vessel containing the milk, which may be the bottle from which it is to be used or any other suitable vessel (see Fig. 2), is placed inside of a larger vessel of metal, which contains the water. If a bottle, it is plugged with absorbent cotton, if this be at hand, or, in its absence, other clean cotton will answer. A small fruit jar, loosely covered, may be used instead of a bottle. The requirements are simply that the interior vessel shall be raised about half-an-inch above the bottom of the other, and that the water shall reach nearly, or quite, as high as the milk. The apparatus is then heated on a range or stove until the water reaches a temperature of 155 degrees Fahr., when it is removed from the heat and kept tightly covered for half an hour. The milk bottles are then taken out and kept in a cool place. The milk may be used at any time within 24 hours. A temperature of 150 degrees maintained for half-an-hour is sufficient to destroy any germs likely to be present in the milk, and it is found in practice that raising the temperature to 155 degrees and then allowing it to stand in the heated water for half-an-hour, ensures the proper temperature for the required time. The temperature should not be raised above 155 degrees, otherwise the taste and the quality of the milk will be impaired. The simplest plan is to take a tin pail (see Fig. 1), and invert a perforated tin pie-plate in the

FIG. 1.

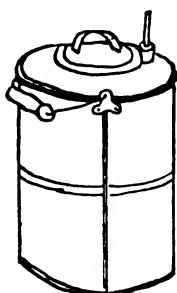
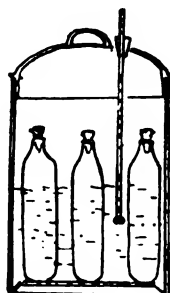


FIG. 2.

*Pasteurizing Apparatus.*

bottom, or have made for it a removable false bottom perforated with holes, and having legs half-an-inch high, to allow circulation of the water. The milk is set on this false bottom, and sufficient water is put into the pail to reach the level of the surface of the milk in the bottle. A hole may be punched in the cover of the pail, a cork inserted, and a chemical thermometer put through the cork, so that the bulb dips into the water. The temperature can thus be watched without removing the cover. If preferred, an ordinary dairy thermometer may be used, and the temperature tested from time to time by removing the lid. This is very easily arranged, and is just as satisfactory as the patented apparatus sold for this purpose.

The Horse.

STABLE NOTES.

By W. C. QUINNELL, M.R.C.V.S.

DISEASES OF HORSES.

INFLUENZA.

INFLUENZA has several synonyms, viz.:—Distemper, epidemic catarrh, the epidemic, epizootic, catarrhal fever, morbofodure, epidemic pleurisy, pink eyes, &c. The first record we have of this peculiar disease is an outbreak which occurred at Seville in the beginning of the fourteenth century. Severe epidemics occurred all over Europe in the years 1688 and 1693, and the last great outbreaks in Europe were in the years 1863, 1864, 1871, 1872, 1890, 1891, and 1892. The disease is widely distributed over the old and new worlds, and is nearly always liable to be met with at all times of the year, but more so in the autumn and the spring.

Definition.—Is a specific, contagious, and infectious febrile disease, chiefly affecting various portions of the respiratory tract of horses, and subject to a variety of complications. It generally appears as an epizootic.

Symptoms of the Complicated Forms.

1. *Thoracic Form.*—In this form the organs of perspiration especially, or the heart, or both, may become affected, more frequently the former.

The general symptoms attending lung complication is often a slight catarrh. Sometimes, however, the attack comes on very suddenly, without any observable premonitory symptoms. The attack itself is generally ushered in by sudden fits of shivering, followed by coldness of the ears and extremities, and other usual signs of inflammation, and a staring coat. The coldness of the extremities is a marked sign throughout the disease. The horse is uneasy, and turns his

head frequently round to his chest. A very prominent symptom, which marks this disease, consists in the horse persistently standing with his forelegs wide apart, and his elbow out. The animal keeps in the position, as it enables greater expansion to the chest, and therefore greater ease. The pneumonia of influenza is characterised by an acute hacking cough, and, in bad cases, very painful cough. The pulse is oppressed and quick, and, at the early stage of the disease, ranges about 60 beats per minute; but if the attack progresses unfavourably, it will become much quicker, and may even reach 100, becoming smaller and smaller in volume.

The temperature rises rapidly, frequently to 104 or 105 degrees Fahr. In the earlier stages of the disease, the mucous membranes lining the nostrils, are found to be paler than usual, but, with the increase of the disease, they become purplish, and then of a leaden hue.

The respiratory movements become disturbed as soon as the disease is established. The head, throughout the attack, is inclined downwards, with the nose protruded and the nostrils dilated. In thoracic influenza, besides pneumonia, we may, as we stated before, have the heart and its appendages attacked. These complications can be easily ascertained by means of careful auscultation—viz., by applying the ear to the horse's chest, in the early stages of pneumonia, a confused murmuring noise, accompanied with a harsh, dry murmur instead of the gentle respiratory sound peculiar to health, will be heard. As the inflammation progresses, the *dry* murmur will give way to a moist rattle. This stage may last from 24 to 48 hours, at end of which time a decided change for better or for worse will occur. During this time the breathing will become quicker, on account of the increasing congestion in the air cells. As pneumonia may attack one lung or one position of one lung or both lungs, the extent and position can be determined by having recourse to the methods of auscultation. The pulse in pneumonia is frequent and feeble, and in the case of cardiac (heart) disease of irregular rhythm.

2. *Abdominal Form*.—In this form the catarrhal inflammation spreads down the asaphagus (gullet), and is likely to involve a considerable length of the alimentary tract, tending frequently to complete closure of the opening of the biliary duct, and thus giving rise to the so-called *bilious catarrhal fever*.

The stomach and intestines may be subjected to great irritation, causing mucus effusion so intense as to lead to a fatal form of diarrhœa. The abdominal form of influenza is divisible into two distinct kinds, each of which requires special notice:—

- (a) In many cases there is an acute irritation of the alimentary tract, in which form acute diarrhœa and great prostration and weakness manifest themselves.
- (b) In other cases we meet with bilious complications. The mucous membranes being severely inflamed in a catarrhal stage, the opening of the bile-ducts are closed, and thus it happens that bile is thrown back in the blood circulation and reabsorbed. This giving rise to yellow mucous membranes, especially inside the nose and the eye (all the visible mucous membranes are yellowish in colour), the fever is thickened, and there is great prostration, the pulse is remittent, and the temperature varies from 101 to even 104 degrees Fahr. The urine is highly coloured and scanty; the fœces are often in a more or less fluid state, and sometimes are most offensive in smell; and other times the bowels are constipated. Constant pawing is also a symptom in derangement of the liver. The animal may evince pain on pressure being applied to the region of the liver. When a patient dies from these circumstances, the liver, on *post-mortem* examination, will be found to be greatly enlarged, of a dark-brown colour, very soft in structure, friable, granulated, and easily broken down by the finger. It may often be found ruptured, or death may arise from this cause.

3. *Rheumatic Form*.—This form usually manifests itself towards the close of the ordinary symptoms of catarrh. It may be diagnosed by the pain and heat in the joints, which crackle when moved, and, after a time, swell. Although the joints are especially liable to be affected, the muscles and the flexor tendons below the knee and hock are also sometimes involved. The pain and swellings like those of rheumatic fever are shifting. Heart complications may appear in this form of influenza.

4. *Treatment of Complicated Forms of Influenza*.—The animal should be placed under good hygienic conditions, and should be kept, in cases, quiet. The warmth of the body and legs must be maintained by clothing and bandages. Water, fresh water, should always be within reach. The diet should, at first, be laxative, and should consist of mashes, linseed gruel, roots, &c. Good nursing is the primary requisite. The great aim, however, must be to support the patient through the disease. Drastic purgatives and strong sedatives must always be avoided. Medicinally, 2 drachms of nitrate of potassium may be given in the water; also, liquor ammoniæ acetatis and spirits of nitric ether may be given in a form of a draught twice or three times daily. Sulphite of sodium in 2-drachm doses, or sulpho-carbolate of sodium in 1-drachm doses, twice daily, may be given in addition.

Thoracic Form.—Treat with liquor ammoniæ acetatis, pot. nitrate or chlorate and camphor. Hot fomentations applied to chest, as mustard, but washed off in 15 to 20 minutes; reapplied if needful. With salines, give alcohol, as whisky, stout, or ale, in early stages, in moderate doses, every three hours.

Abdominal Form.—(Gastro-intestinal, treated with, in early stages, by a few doses of greu-powder or calomel, conjoined with laxatives, as linseed oil or Epsom salts. In later stages, by intro-hydrocholic acid. Abdominal pain relieved by chloral, morphia, and chloric ether, or morphine hypodermically.

If there is much yellowness of the mucous membrane of the mouth or of the conjunction in the commencement of the disease, half a drachm of calomel may be given, and repeated the next day, and followed by a diffusable stimulant. This may be followed by 10 or 12 oz. of linseed oil, if constipation be present, and also by enemata.

Rheumatic Symptoms.—Treated with salicylic acid, oil of turpentine, diuretic doses of digitalis and salines, with stimulation of affected muscles and joints with embrocation and liniments. If much swelling be present, diuretic salines, combined with diffusable stimulants, are useful. Gentle friction and bandages are also valuable adjuncts.

Signs of recovery are indicated by restoration of the action of the bowels and secretions of skin and kidneys, by the discharge of nostrils assuming a healthy character, by the visible mucous membranes recovering their proper colour, by the pulse temperature reaching their normal standard, and by the animal lying comfortably down.

Poultry.

INDIAN RUNNER DUCKS.

THIS duck has of late come into much favour with some poultry-breeders. There are some who object to the breed—namely, to its dark flesh, and, as they say, to its erratic laying; but on this last point Mr. Pitman, writing to *Garden and Field*, says:—"My nine Indian Runner Ducks still continue to lay well; for the 15th month, ending 20th August, they have laid 191 eggs, making a total of 2,483, an average of 276 each." Mr. G. H. Dean says:—"As egg-producers they are superior to Minorcas, and for flesh and breast meat far better than the Pekin or Rouen. Ducks that will average 250 eggs a year are

surely worth a prize at our dog and poultry show. These ducks cross well with Rouen or Pekin, and give a much fuller-breasted bird for table. Their eggs have not the strong flavour so noticeable in Pekins. Another great advantage in breeding these birds is that they are exceedingly hardy and no trouble to rear."

THUNDER AND HATCHING.

THERE is an old superstition that thunder kills the chicks in the shell, and that the hen sitting at the time of a heavy thunderstorm is not likely to bring forth any young. How the belief originated we cannot understand, yet it has credence all over the world. We made a number of tests in this direction, at one time having 15 hens sitting when a heavy thundershower came up. It fairly shook the building, and we became curious to know what the result would be. It took from a week to 10 days until all the hatches were due, and yet a better lot of ducks we never had. On another occasion we had an incubator full of eggs, and they had but a few days more to come out, when a terrible storm arose, yet the hatch was a good one.—B.B. in *Rural World*.

THE PRESERVATION OF EGGS.

THE results of a series of experiments on the preservation of eggs are published in the *Berliner Markthallen Zeitung*. Fresh eggs were treated by twenty different methods in June, and after being allowed to remain eight months were examined at the end of February. In only three of the methods employed did all the eggs remain sound. These were (1) covering with vaseline, (2) preserving in lime water, (3) preserving in a solution of silicate of potash. The treatment with vaseline, however, is a tedious business, submersion in lime water induces a disagreeable flavour, and the use of silicate of potash renders the shell extremely brittle so that it is expedient to pierce it with a needle before putting it into boiling water for cooking. Whichever be the method employed, it is desirable that only non-fertile eggs should be subjected to the process of preservation. Twenty per cent. of the eggs went bad that had been (1) covered with lard, (2) preserved in wood ashes, (3) varnished with shellac, (4) put in a mixture of boric acid and silicate of potash, or (5) treated with permanganate of potash. Of eggs varnished with silicate of potash or with collodium, 40 per cent. turned bad. Of eggs that had been plunged for 12 to 15 seconds in boiling water, or immersed in a solution of alum, or in a solution of salicylic acid 50 per cent. were found to be bad. Of eggs rubbed with salt, or preserved in bran, or covered with paraffin, or treated with a mixture of salicylic acid and glycerine, 70 per cent. went bad. Of eggs wrapped in paper 80 per cent., and of eggs kept in salt water 100 per cent., were found to be bad.

FOWLS FOR EXHIBITION.

By CORINDA.

THERE are many who consider breeding birds for show a waste of time, but the fact remains that a great many people, including ladies, are extremely fond of this hobby, which, for my own part, I think is not only a very interesting but at times a remunerative one. The majority of fanciers, however, are satisfied if they can make ends meet, and at the same time remain the possessors of one or more of the many beautiful varieties of poultry that not only afford pleasure to the breeder but are admired by others who, perhaps, have not accommodation for them, or cannot spare the time to give them the attention that they certainly require.

To those who have had little or no experience in purchasing fowls or eggs, but may desire to own a few birds for exhibition purposes, my remarks are chiefly addressed. Whatever variety you have made up your mind to go in for, be careful to find out who have been the most successful breeders and exhibitors of the same, and, as far as possible, if they are "straight" and will sell you birds at a fair value. To those who can afford it, I should always recommend purchasing a cock and two pullets to breed from, in preference to buying eggs—this, of course, being a more expensive way of commencing, but, in my own opinion, more satisfactory. If, however, the purse is not long enough, and the would-be fancier decides in favour of eggs, buy from a reliable breeder any time from July until October, and see that you have a broody hen well tried before putting down your setting. Satisfy yourself on this point by putting a china-egg under her for a couple of days, and then, if she proves to be thoroughly broody, take it away (in the evening is the best time) and substitute the setting you have purchased. Be sure she is in a place where she will not be disturbed, and also that the nest is clean and made up after the shape of a soup-plate in order that the eggs cannot roll away and get cold. If the eggs are fresh and fertile, the chicks will appear in twenty-one days, and are best left under her undisturbed the first day, as no food is required for twenty-four hours after hatching. On the second day, place her under a coop in a dry place, where the chicks can get the morning sun, and at the same time get shade when the sun gets too hot. See that they get a good drink of cold water first thing; then throw the balance away, and give some more later in the day. Nothing is worse for chicks than water made warm by the sun. As to the best food, &c., an excellent article appeared in the September number of this *Journal*. At three months old, the waste birds should be weeded out and the cockerels separated from the pullets. The object in this particular branch of poultry-breeding is to get them by *any* means to the greatest possible size—not that size is everything in the show-pen, but a good *big* one will always beat a good small one; so feed liberally, and be sure they get plenty of green stuff and grit, as this is absolutely necessary for good health. Do not allow your chicks to roost on perches—a batten is preferable, but a good dry bed of clean dry ashes is better than anything.

About a month previous to the "show" you will probably have decided which bird or birds you intend to exhibit. These should be penned off, and receive special attention. A little extra feeding, with a few dainties, such as a little raw meat chopped up fine, to bring out the combs; linseed in the soft food, to improve the plumage; and a piece of rusty iron in their water—all help to improve their chances of winning a prize and making a name for their breeder.

About a week before the show they should be placed in separate pens, about the size of those used in the shows—be frequently handled so as to tame them—a bird used to being handled always shows much better than one caught the night before exhibiting and then confined for the first time. Their combs and legs should be washed, using a soft nailbrush and good yellow soap; and a little vaseline rubbed on the comb, and then dried with an old handkerchief, will brighten its appearance.

Only white birds require to have their feathers washed; and as this requires to be done thoroughly and is of great importance, I will leave it over for my next letter in the November number of this *Journal*.

The Orchard.

OLIVE CULTIVATION.

THE olive is found widely distributed in all the temperate parts of the globe. It will not produce fruit, or at least will not mature it in exceedingly hot or exceedingly cold localities—a temperature of 10 degrees Fahr. will destroy the trees, especially if wet weather should ensue. But, although the stem may be killed by heavy frost, the roots remain intact, and a fresh stem may be raised from the living roots. In the Southern States of America the cultivation of the olive has greatly extended, and a crop of oil has been obtained from trees four years after their having been planted out, and a full crop in eight years. The tree thrives best near the sea-coast, but will fruit well inland. As the olive does not demand a rich soil, it can be profitably grown on lands which are useless for other purposes. This is one great advantage it possesses over other trees. Another is that it does not require so much attention as, say, citrus and apple trees. It will stand years of neglect, and then spring into vigorous bearing if the soil be stirred about its roots. A third great advantage is that once planted the tree is a permanency. It is practically indestructible, and lives and bears to an incredible age. The returns are certain and regularly increasing.

Absolute poverty of soil is not a desirable qualification for the olive, but a poor, well-drained, dry soil is suitable. Clay soils are to be avoided. In planting an olive grove it is well in Queensland to choose a site open to the morning sun—that means an easterly aspect. Thus the trees are sheltered from the rough westerly winds.

There are several ways of obtaining olive plants. One is by cuttings. These may be made either from the branches or roots. Each cutting of the former should be from 10 to 14 inches long, and should be planted at such a depth that only one bud remains above the surface. Root cuttings are best planted entirely under ground. The tree will also grow from layers.

Another method is to plant suckers rising from the roots. These should be taken off with a good “heel,” and they form a stem to start with.

Olive-trees may also be raised from seed, but this must not be without preparation. The seed has an oily covering or pericarp, which will prevent the necessary moisture reaching it. To overcome this, it must be steeped for a day in hot water, or it can be plunged into some alkaline substance which will combine with the oil and convert it into a soapy substance which is soluble in the earth.

Very stout cuttings, called “truncheons,” may be planted. These may be from 1 foot to 10 feet in length, and from 2 inches to 6 inches in thickness. The longer truncheon may be planted to a depth of 4 feet.

Mr. Lewis A. Bernays, who wrote in 1883 an exhaustive article on the “Cultivation of the Olive in Queensland,” says:—

The process of planting is as follows:—In early spring open the holes to such a depth as the nature of the soil admits. Next, plant the truncheon or pole upright, taking care to throw in a good layer of chopped turves and leaves, decayed stable manure, or any fertilising matter which has thoroughly ripened and is not hot, and filling in firmly with the soil which was taken out of the hole. Leave the ground round each plant slightly hollowed to facilitate watering, which, unless the ground is in a moist state, should be done at once, and repeated from time to time when the weather is dry. The object of enriching the bottom of the hole is twofold. It stimulates the truncheon to send out roots from the bottom end, and so ensures a well and deep rooted tree, whilst it also assists mechanically in retaining moisture where it is most needed.

In transplanting rooted trees from the nursery, or to relieve too quickly planted rows, the same precautions should be adopted.

When the wood left above the ground is long, the soil is sometimes heaped round it in the form of a cone, to mitigate the drying influence of the air before the plant has rooted, a hole, which is kept open by a wisp of straw, being made on one side to facilitate watering in dry weather.

The advantage of planting truncheons in the way described (in the position which the tree is to occupy permanently) is that you thereby save a whole year, and commence with a good stem to form the trunk of the future tree.

But I need hardly say that there must be no scamping of labour or slurring of the work, which, to effect these objects with certainty, must be thoroughly and intelligently done.

I come now to the second method of propagating by truncheons. In this case they are cut from 1 foot to 3 feet long, the short lengths being, I am disposed to think, preferable. They should be cut neatly, without any bruises or ragged edges in which moisture could lodge and do mischief, and bedded horizontally (flat) 4 or 5 inches beneath the surface. The soil for this purpose should be fine and kept moderately moist. The grower must not be impatient if the shoots are long in making their appearance, as much depends on the season. In two years, however, you will have trees 4 to 6 feet high, with stems from 1 to 2 inches in diameter (according to kind), which are fit for planting out, and from which you will be able to take strong scions for grafting your seeding plants. These, of course, you have been growing in the meanwhile, if you want any considerable stock of trees. Keeping carefully in mind the heat of our climate and the dryness of our spring, I would recommend this method burying truncheons in preference to the other for beginners in this important industry. The other method, with some additional protection to the exposed stem from the drying influence of the air, may answer in Queensland as elsewhere.

Propagation by Grafting.—Grafting the olive is much practised, and is among the most certain methods of securing strong trees of approved varieties. The "Shield," the "Cleft," and "Crown" grafts are all used and variously recommended, but it is immaterial which method is adopted if the scion and stock suit each other in point of age and size. Underground grafting in this climate is decidedly preferable, not more than two eyes to the scion being left above ground. The operation should be performed in spring, when the sap is rising, the scions being of two-year-old wood.

Propagation by Uovoli.—This method of increasing good varieties of the olive is both curious and interesting. The word is Italian, and means, literally, "little eggs." These are small knots or excrescences, which form, often in some numbers, on the bark, especially of the upper roots. They are easily detached with a sharp penknife, but care must be taken not to injure the tree. This should be at least ten years old, both because before that age it is not worth while examining for *uovoli*, and because the tree should be mature, deep-rooted, and strong before such liberties are taken with the bark. When removed they are planted like bulbs; and, by much the same process of nature as in the case of the propagation of the vine and the potato by eyes, in due course become young trees. These *uovoli* are, in fact, embryo buds, or what are technically known as *knaurs*, the theory of which is that they have been adventitious buds, which, by pressure of the surrounding growth of bark, have been forced into woody excrescences.

Cultivation.—The importance of thorough drainage for the olive has been already pointed out, and the intending cultivator, bearing this well in mind, will, of course, understand that the digging of holes is not to imply that the intervals are not to be left without breaking up. Where a depth of 4 feet is used, it would be impossible, without artificial drainage, to prevent the wet from hanging about the roots, unless the soil were naturally deep and very porous. It must be remembered that one of my objects in urging the cultivation of the olive is that thereby the slopes of our hills, the soil of which is generally unfit for cultivation, may be utilised. In these situations, any considerable depth of soil will

not often be found, and 24 inches will, as a rule, be found the maximum depth attainable. If this be the case, holes will have no advantage in point of economy over continuous trenching, say, to the width of 8 to 10 feet. While such trenches will afford sufficient room for the health of the trees, these will still benefit by the breaking up, at some subsequent period, of the intervening spaces either by the hoe or plough.

Cultivation between the trees should be practised with great caution. When the trees are quite young, and cover little space, a shallow rooting crop may with safety be taken off, provided that even then the seed is not allowed to fall within 5 feet each way of the trees. If this be done for a year or two with safety, it is as much as can be ventured.

Manuring with suitable fertilisers, at intervals, forms an important element in the successful cultivation of the olive, especially in soils naturally poor. While the tree rejoices in the mechanical looseness of sandy, gravelly, and stony soils, and in freedom from stagnant moisture, the olive is not among the very small number of fruit-bearing trees which are most fruitful in sterile soil.

Nutriments are necessary to its productiveness, and, if not already in the soil, must be introduced artificially. The stronger kinds of manure are recommended for the olive—such as pigeon and sheep dung; but the best of all for sandy soils is nightsoil.

Raw, unripened, hot manures are as bad for this tree as they are for most others. There is nothing to equal a good old compost heap. The heap should be occasionally turned until thoroughly incorporated, and when mature, which will probably not be for 12 months, may be with great advantage applied to the trees, being well turned in under the surface.

An addition of lime to the compost heap, or its separate application, will soon make its effects visible in the healthy appearance and more vigorous growth of the trees.

Where the soil is absolutely poor, the trees should be manured every year, but otherwise every second year will be sufficient.

Mulching the trees will be found a useful adjunct to the cultivation of the olive in our hot, dry climate.

Pruning judiciously is of great importance, as the olive has the character of bearing only every other year. The fruit is produced on the young shoots of the preceding year, and, in pruning, the object to attain is to secure a regular distribution of wood of the previous year from the axils of the leaves. In poor soil, pruning is especially necessary, and I am disposed to think that, in our genial climate, plantations, skilfully managed, ought to bear, with fair certainty, a regular annual crop. Under the present system of cultivating comparatively dwarf trees, abundant crops are afforded in three or four years. A clear, straight stem of 5 or 6 feet should be kept. Not only is the growth thus made handsome, but the tree is more vigorous and strong to resist wind, and the fruit is sufficiently remote from reflected heat and consequent premature ripening.

The distance apart for planting the trees must be determined partly by variety and partly by soil and aspect.

Owing to the adoption of a system of pruning the trees to such limits as will render the gathering of the fruit by hand comparatively easy, cultivators have been enabled to bring their trees closer together. Orchards are now planted at distances from 16 feet up to a maximum of 30 feet, according to variety.

The following tables will show the number of trees which can be grown per acre at 16, 20, 30, and 40 feet apart respectively:—

1.—*Acre, of shape 220 feet long by 198 feet wide.*

Deducting dray road (12 feet wide), we have—

Area to be planted = 174 feet wide by 196 feet long, which will admit of—

10 rows, with 11 trees in each row, 16 feet apart.

8 " " 9 " 20 "

5 " " 6 " 30 "

4 " " 4 " 40 "

the fractional parts of the space being adjacent in each case to the dray road.

2.—*Acre, of shape 264 feet long by 165 feet wide.*

Deducting dray road (12 feet wide), we have—

Area to be planted = 141 feet wide by 240 feet long, which will admit of—

8 rows, with 14 trees in each row, 16 feet apart.

| | | | | | | |
|---|---|---|----|---|----|---|
| 6 | " | " | 11 | " | 20 | " |
| 4 | " | " | 7 | " | 30 | " |
| 3 | " | " | 5 | " | 40 | " |

3.—*Acre, of shape 330 feet long by 132 feet wide.*

Deducting dray road (12 feet wide), we have—

Area to be planted = 108 feet wide by 306 feet long, which will admit of—

6 rows, with 18 trees in each row, 16 feet apart.

| | | | | | | |
|---|---|---|----|---|----|---|
| 4 | " | " | 14 | " | 20 | " |
| 3 | " | " | 9 | " | 30 | " |
| 2 | " | " | 7 | " | 40 | " |

COLLECTING THE ABOVE RESULTS, we have the following table :—

| Distance Apart. | Acre. 220 x 198. | Acre. 264 x 165. | Acre. 330 x 132. |
|-----------------|---------------------|---------------------|---------------------|
| 16 feet | 110 trees required | 112 trees required | 108 trees required |
| 20 " | 72 " | 64 " | 56 " |
| 30 " | 50 " | 28 " | 27 " |
| 40 " | 16 " | 15 " | 14 " |

The proper time for gathering the fruit is on the eve of maturity. If delayed too long, and the fruit becomes over-ripe—especially if it be allowed to fall—you lose in quality, though gaining somewhat in quantity. I would point out, as one of the advantages of the crop, that if, from press of other operations on the farm, the owner is unable to gather his olives when he would wish, they are yet available to him—even in a state which, in other fruits would be regarded as rotteness—for the production of a still marketable though not so valuable a commodity. Early gathering relieves the tree, and gives time to strengthen for another crop.

The best method of gathering is by hand; the system of cultivating low-growing trees much facilitating the harvest. The gathering can be done by children with the aid of light steps. The system of beating the fruit from the tree with light rods should never be practised. However skilfully done, it cannot fail more or less to injure the light branches. The practice also has the additional disadvantage of involving the picking over of the fruit in order, before pressing, to separate the leaves, sticks, and other rubbish. Shaking the tree is also resorted to as a means of obtaining the fruit, but the plan is not recommended.

A good method of ascertaining if the fruit is fit for gathering is to apply a slight pressure with the finger and thumb, when, if the oil exudes, the olives are considered fit for the press. The largest fruit is the Spanish.

The harvest extends over six weeks or two months; and as the fruit matures and is gathered, it should be laid on shelves so as to slightly dry, Contact will do no harm so long as it does not bring about actual heating, as excessive fermentation results in an inferior quality of oil.

The bark, the fruit, and the wood of the olive are all utilised.

The form in which we are accustomed to see olives is in small bottles in salt and water. They undergo various treatments to prepare them for this purpose. From many receipts I select the following :—

The lye is to be made as follows :—Take 3 lb. of fresh wood ashes, 6 oz. of fresh quicklime, 6 quarts of cold water, mix well and boil gently for 30 minutes, keeping well stirred. When the olive is full grown, but quite green,

gather carefully the quantity required without bruising (of the largest kind), and place them in a clean vessel (not iron) pure from any greasy matter, and, when the lye is cooled down to 150 degrees Fah., pour sufficient on the olives to well cover them; soak for about 30 hours. Then pour off the lye entirely and rinse the berries with fresh cold water, and for three days keep them in cold water, changing it two or three times each day. Then, having prepared the pickle (salt and water) of about the strength that will float an egg (the better plan is to boil the water and pour it on the salt, leaving it till quite cold), and, having clean bottles thoroughly dried, put in the berries, shaking, but not pressing them down, and pour in sufficient pickle to cover the olives, leaving a space of about 1 inch from the cork, which should be good and tight-fitting. Cover with pieces of bladder well tied on and secured from the air by some wax of black resin and beeswax.

OLIVE OIL.

The principal use of the olive is the production of the olive oils of commerce. The finest qualities are most in requisition for food purposes. There is another very important use to which to put olive oil. In the manufacture of cloth from 4 to 5 gallons of oil are used in the conversion of every bale of wool.

Soft soap is made of olive oil and potash; Castile soap of this oil and soda.

The Marc, or oil cake, is valuable as feed for cattle. Other products of the olive are "Oleine" or "Elaine," "Stearine," "Palmitine," and "Margarine," each capable of separation by chemical process, and having their respective uses in the arts and manufactures.

The plant required in the manufacture of olive oil consists of a mill for crushing, a press for separating the oil from the solid portions of the fruit, receivers into which the oil is run from the press, and the necessary vessels for storage and for the market. In the large majority of cases, the machinery employed is of the rudest kind, the same form having been handed down from generation to generation. A very small capital is required for oil-making, and the implements are so simple that, with the exception of the millstones, any intelligent rough carpenter could make them. The stones must be of hard, unabsorbent material, such as granite. The reason for this is obvious, for it can readily be seen that, were the stones of a porous character, they would soon become saturated with oil, which, becoming rancid, would taint all that came in contact with it. Screw-presses are also used, but the pressure is sometimes obtained by means of a lever or, more rarely still, by hydraulic power. The bags used for enclosing the crushed olives, before putting into the press, are made of coarse linen, horsehair, open felt, rushes or grass, and when filled are laid one over the other in the press to the number of sometimes a dozen. In the extraction of the oil, there are two distinct processes, viz.:—(1) Crushing; (2) Pressing.

In the first process the fruit is by some completely crushed, and by others the pericarp (the fleshy covering) only is first crushed; and when the oil from that part of the fruit has been separately expressed, the more complete crushing is applied for obtaining the remainder of the oil.

The crushing process should be conducted by a slow and regular movement, without jerking, in order that all the oil cellules shall be broken, and the press not be called upon to do any of the work which is supposed to have been previously done by the mill.

The pulp or paste is then shovelled into the bags, which are placed one on the other in the press. Here also the power should be applied steadily, slowly, and regularly to afford time for the oil as it exudes to escape from the press through the proper channels.

What is known generally as "virgin" oil is that which spontaneously separates or is obtained by the first pressing before the application of water or heat to the pulp. This is run into water, where it is allowed time to deposit its mucilage, and after being skimmed off is kept separate for the finer uses.

When of good quality, and especially when fresh, olive oil is of a pale-greenish colour, with a sweetish nutty flavour. Inferior oil is of a darker colour, being a yellowish or brownish green.

So soon as all exudation of oil from the first pressing ceases, the screw is reversed, and the bags are removed and emptied. The pressed pulp being put carefully aside and the bags refilled, pressure is again applied, and the process repeated till the whole crushing has gone through the mill.

The Marc, which has thus been once pressed, is then thoroughly separated and stirred up with boiling water, and the process of pressing renewed; this time the pressure being increased, though still gradual and steady. This second oil is nearly as good as the first, but is apt to become rancid in time. The principal of the oil after this second process is skimmed off the water in the receivers; but entire separation takes a long time, and when it is complete the process is reversed by the water being drawn off from below.

Once more is the Marc subjected to treatment with boiling water, and it is at this stage that, when the stones were not crushed at the first milling, that process is now gone through, and the last of the oil obtained. This pressing is, however, regarded as of inferior quality, and is kept carefully separate from the results of Nos. 1 and 2.

The water which has been used in the several processes, and which still contains an admixture of oil, is conducted into large reservoirs generally constructed underground. Here it is left for a considerable period, during which the mucilage, water, and oil thoroughly separate—the former falling to the bottom, while the latter rises to the top, whence it is ultimately skimmed off, and applied to local uses of an inferior character, such as burning in lamps.

There are yet processes for still further extraction of oil to the last fraction, which it is here unnecessary to describe. My object (says Mr. Bernays) is to encourage the establishment of oil-making as a new industry, and to show that some of the processes are simple, yet perfectly efficacious, and require so little money that the application of such a large word as "capital" would be out of place.

After manufacture, the oil is finally deposited in stone jars or in tanks, to facilitate the deposit of impurities which are still held in suspension. Air and light are both excluded, as they would tend to decomposition and rancidity. In a few months the clear oil is racked off into fresh jars for stock, or into other packages for the market, while the inferior is sold for soap-making, lighting, lubricating, or other such purposes.

Decandolle states the quantity of oil produced by the olive at 50 per cent. of the gross weight.

Sieueve tells us that 100 lb. of olives yield 32 lb. of oil, viz.:—21 from the pericarp, 4 from the kernel, and 7 from the shell. Others state it at 25 per cent.; whilst from an inferior variety the yield is set down as low as 10 per cent.

Calculating the yield per tree, it is extremely difficult to give an average. In the case of the olive, as with many other vegetable products, no rule can be laid down. Its productiveness is governed by variety, climate, soil, culture, and age.

The quantity of the crop is also liable to be affected by extremes of wet or drought, lateness of season, hailstorms, gales of wind, and seasons unusually rife with destructive insects; but after allowing for all possible drawbacks, in olive countries, the tree is considered to yield one of the most profitable crops known to agriculture.

The lowest average yield that I can find is 1 gallon per tree, while on other estates the average is given at from 1½ to 2 gallons per tree. The yield of individual trees is given at from 12 to 20 gallons, while one tree of renown is stated to have yielded as much as 55 gallons, and another 3 cwt. of oil.

Taking the lowest average—viz., 1 gallon to the tree, and 60 trees to the acre, the produce at 8s. per gallon*—the Brisbane market value of the imported

* Olive oil produced at St. Helena, in August, sold at from 12s. to 15s. per gallon.—Ed. Q.A.J.

article would be £24 per acre in the early years of bearing, while the value of the olive, when cultivated, increases as a matter of certainty with each additional year of age until maturity. Taking the produce, in the early years of bearing, at one-fourth of that named, with the knowledge of what to expect as, year by year, the trees grow older, we can still afford to wait. The oil cake, of course, also has its value, and, although in Australia we do not as yet stall-feed our cattle, there is, at least, our old friend the pig quite prepared to convert the olive-oil cake into bacon, hams, and lard.

OLIVE-TREES IN QUEENSLAND.

The olive has fruited well on the coast lands near Brisbane, and gives good promise on the Darling Downs. Of the plantation formed by the late Dr. Ricci, on Westbrook, Mr. Davidson, the then manager of the station, wrote to Mr. Bernays as follows:—"These trees, now six years planted (1883), have grown exceedingly well, in height rather than thickness, some of them being quite 10 feet high. This I consider a great growth, when it is allowed that the trees have had to pass through four most severe seasons of drought and one of the worst winters for frost ever remembered here, receiving during all this bad time no artificial watering or help. Some of the trees fruited last year (1882), and a few this. The fruit appears to be of first-class quality, being well fleshed and of good size. I have no doubt, if these trees get a good season or two, they will thrive and bear splendidly. I am of opinion that the tree will do far better if grown on a chocolate than on the heavy black soil."

Mr. Thomas Petrie, in 1883, wrote to Mr. Bernays about some olive-trees which he had planted at North Pine in 1873. In ten years they were 20 feet high and 18 feet across.

Mr. A. Petrie says that these olive-trees have now been planted about 30 years. They have never been cultivated or looked after in any way since first planted. Last season a quantity of the fruit was pickled and turned out very well. There are two or three different kinds, but the names have not been preserved. Some of the trees are about 20 feet high, whilst others resemble well-grown orange-trees more than anything else. They do not bear very regularly. In some years there is scarcely any fruit.

With reference to the irregular bearing of Mr. Petrie's trees, it should be borne in mind that all fruit is borne on two-year-old wood, and new shoots are therefore necessary to regular bearing. The nomenclature having been lost, it may assist the grower to know that the largest olives are the Picholine, having 77 to the pound; the Sevillano, only 36·2; Polymorpha, 71·9; Macrocarpa, 72·3; Asiolana, 60·6; and Amygdalina, 76·9. Although much smaller, the Mission Olive, with 111·6 to the pound, is well suited for pickling, and, as it also produces oil of good quality which keeps well, this combination of qualities recommends it to growers. The Mission has 22·51 per cent. of oil in flesh, and only 61 in the pith. It is therefore not tainted with the flavour of "pith oil." The Manzanillo has 106·6 olives to the pound, 19·73 per cent. of oil in the flesh, and only 55 in the pith. The Nevadillo Blanco is the fruit to suffer from frost. It contains two-thirds more oil than in France, and is twice as large in California—157·3 make a pound. It has 22·92 per cent. of oil in the flesh and 99 in the pith. Pendulina needs 157·1 to the pound, and gives 21·36 per cent. of oil in the flesh and 99 per cent. in the pith. Rubra wants 196·1 to the pound, gives 22·01 per cent. of oil in the flesh, and 75 in the pith.

The above figures are from "Olives," by F. T. Bioletti, of the University of California.

At the Penal Establishment at St. Helena, in Moreton Bay, there is a fine grove on the hillside of 71 olive-trees, in addition to 19 large trees near the dairy, and two of larger size in the garden of the superintendent's house. All these were planted many years ago by Mr. Hamilton, who was the first superintendent of the establishment. They amply demonstrate the suitability of the soil and climate of the island to the cultivation of the olive, the soil being a rich, red, volcanic bed of great depth. It produces enormous crops of general farm produce, especially of sweet potatoes, lucerne, sorghum, and garden stuff.

The larger grove of olives is planted on a very steep hillside, which could not be utilised for any ordinary crops. They are planted in rows 14 feet apart, the trees being 12 feet apart. This was long ago seen to be too close, as the branches soon interlaced and formed a dense mass of foliage overhead. They have, however been judiciously pruned, but are far too high according to modern ideas of olive-growing. Some of them rise to a height of from 24 feet to 30 feet, with a spread of from 20 to 30 feet. Many of the trees have a circumference of over 5 feet, and one tree measured about 6 feet near the ground where it spread into four distinct trunks.

One or two, which have been cut down to a height of 5 feet from the ground, have sent out fine healthy shoots which promise to develop into handsome symmetrical limits. From such trees the fruit will be easily gathered by the help of a step-ladder, without undue use of a pole, which so damages the taller trees when the crop is gathered.

The best and largest fruit is gathered from the splendid trees in the garden. These trees rise to a height of 40 feet, and their branches spread 20 feet in either direction. From one trunk three enormous stems spring at a height of 2 feet from the ground.

All the trees bear freely, and every year oil is made. The fruit has on several occasions unfortunately been attacked by a worm, which caused great loss.

This year 30 gallons of oil were made, but, as no record was kept of the weight of fruit gathered either per tree or in the aggregate, we can say nothing as to the average yield. The oil made is, however, of excellent quality (which would have been still better had granite millstones been used instead of iron rollers), and finds ready sale at from 12s. 6d. to 15s. per gallon.

It is expressed in a very primitive manner, and for this purpose the old sugar-mill rollers are used. There is a very good engine, which used to drive the rollers, but it is not used, the motive power being supplied by four men, who apply a stout lever under the cogs of the wheel which moves the rollers. The process is naturally very slow, and with a very heavy crop would not pay to continue. After the preliminary crushing, the Marc is placed in rough-woven, basket-like bags, and the remaining oil expressed in the manner above described.

There can be no doubt that the olive succeeds admirably in Queensland. Here and there, wherever they have been planted in years gone by, both on the coast and below or above the Range, they all look healthy, although neglected for years. There is no trouble in planting them. Truncheons are easily procured, and they will thrive on any bit of waste land useless to the farmer or planter. To the young farmer just started in life they would be a certain source of income in a very few years, whilst to the older men who planted them it would be a source of satisfaction that they had by so doing left a valuable legacy not only to their children but to their great-grandchildren.

There appears to be a movement at present in the direction of olive cultivation, and we earnestly recommend it to the attention of all cultivators of the soil throughout the colony.

Sir Samuel Davenport, K.C.M.G., who is practically the pioneer in olive-growing in South Australia, reports that this season he has obtained from one tree over 5 cwt. of olives. The tree in question is over 40 years old. The olive crop generally has been good this season, and a considerable quantity of oil has been made.

FRUIT CULTURE IN QUEENSLAND.

By ALBERT H. BENSON.

MANURING, No. 1.

THE necessity for the systematic manuring of Queensland orchards is one that fruitgrowers have hitherto given comparatively little attention to; the reason being that, owing to the inherent richness of many of our virgin fruit soils, trees

have continued to thrive and to bear good crops of fruit year after year without manuring. There is, however, a limit to the productiveness of all soils, and this is now being shown in the case of many of our older orchards where the roots of the trees occupy the whole of the ground, and the available supply of plant food has or is about to become more or less exhausted, and the health, vigour, and productiveness of the trees to deteriorate in consequence.

The knowledge of how best to obtain and apply the plant foods required by any particular soil in order to obtain the best returns from any particular variety of fruit or farm crop constitutes the science of manuring, and the practical application of this science of manuring is of the first importance to the fruitgrower who wishes to make fruitgrowing a commercial success—that is to say, to raise the most fruit of the best quality that his particular soil is capable of producing.

As the principles of the science of manuring apply not only to fruit trees but also to the growing of all kinds of farm crops, I purpose widening the scope of this article somewhat beyond that of fruit culture, as I believe that a little practical general information relating to the manuring of vegetables and farm crops will be of value to many who combine fruit culture with vegetable-raising or general farming, or with both.

WHY IS MANURING NECESSARY?

It has been shown by chemical analyses and practical experience that, in order for a soil to be capable of producing any particular crop or crops, that soil must contain a sufficiency of all the plant foods in an available form that are required for the proper development of such crop or crops; and if any one or more plant foods be present in insufficient quantity, then the soil can only become fertile by this deficiency being made good—by the application to it of a manure containing the particular plant food or foods in which the soil is deficient.

Some of our soils are poor naturally, and are incapable of producing satisfactory returns without the application of manure, but in others the deficiency is due to injudicious cropping—viz., the growing of one particular fruit or farm crop year after year—which has exhausted the soil of one or more of the particular plant foods required by the fruit or farm crop. This exhaustion of the soil may be obviated to a great extent by judicious cropping and cultivation, especially by planting a rotation of crops, taking different plant foods from the soil instead of growing the same crop year after year, till it has completely exhausted the soil in the particular plant foods that are required for its proper development. Where exhaustion of the soil is due to injudicious cropping, it is advisable to give the land a rest from the particular crop that has exhausted it, to replace those plant foods of which it has become depleted, and to grow another crop altogether.

In all soils, excepting possibly very rich alluvial, which will stand cropping for a large number of years without becoming exhausted, it is found that even with the best methods of cultivation and the rotation of crops the virgin richness of the soil becomes gradually decreased, and this is due, not only to the loss of plant foods removed from the soil by the crops grown off it, but also to the loss of plant foods that are washed out of the well-tilled land by heavy rains. This is seen in the case of our rich volcanic scrub soils. At first they are friable and rich in humus, but with cropping they gradually become less friable, more compact, and comparatively poor in humus, so that their fertility, which is remarkable at first, decreases rapidly and can only be renewed by judicious manuring.

Many soils are also rich in one or more plant foods, but are deficient in one particular plant food, and such soils become fertile when the particular plant food in which they are lacking is supplied to them by manuring. These few illustrations will, I think, suffice to show the necessity of manuring.

HOW PLANTS FEED.

In order to know how plants feed, it is advisable in the first place to see what a plant is made of. If a plant is burnt, it will be noticed that a considerable portion, which varies from 92 to as high as 99½ per cent. of the total weight of the plant, passes off in the form of an invisible gas, and that the balance remains as an incombustible ash. The portion that is lost constituted what is known as the organic part of the plant as distinct from the ash or inorganic constituent. Plants feed by means of their leaves and roots, the leaves supplying the greater portion of the organic constituents, whereas the roots supply the inorganic.

Plants consist of three main parts—roots, branches, and leaves. The leaves are the lungs of the plant, and have on their under surface innumerable small openings or mouths, which are open during the day and closed at night, and through which the plant breathes, and it is by means of these mouths that plants obtain direct from the atmosphere the whole of the carbon required to build up the tissue of the plant, and to form the various carbo-hydrates, such as starch, sugar, &c. In the atmosphere there is always present about 4 parts in 10,000 of a heavy gas, known as carbon di-oxide, which consists of 1 part of carbon and 2 parts of oxygen, and this gas is absorbed by the leaves of the plant through the mouths, and the plant has the power of breaking it up into its component parts. The carbon it retains and assimilates, converting it, in conjunction with water, first into cellulose, and a part of the cellulose is further converted into the various carbo-hydrates found in plants, and the oxygen it returns to the atmosphere. Small as the percentage of carbon di-oxide in the air appears to be, it is nevertheless several times greater than that required by any crop, and, although it is always being used during daylight by all plants, there is no diminution in the amount, as the supply is being constantly renewed by means of fires of all kinds, and by the exhalations of all animals. Plants are distinguished from animals by this means, as plants inhale carbon di-oxide and exhale oxygen, and animals inhale oxygen and exhale carbon di-oxide, and thus the amount of carbon di-oxide in the atmosphere remains stable. Nitrogen, though it constitutes about four-fifths of the atmosphere, cannot in most cases be obtained by plants directly from this source, though leguminous plants have a power to assimilate nitrogen, probably from the air that is contained in the water that is taken up by the plant by means of its roots.

It is their power of assimilating nitrogen that renders certain varieties of leguminous plants, such as vetches and cow peas, of such value for green-crop manuring, as it is the cheapest way of supplying a soil with nitrogen, and, where the soil is deficient in organic matter as well, it is one of the cheapest and most effective methods of manuring. The oxygen and hydrogen required by the plant are obtained from the water that is taken up by the roots, and which is absolutely necessary for the plant's existence, and all the other elements that enter into the composition of the plant are obtained in a soluble form that is dissolved in the water that is taken up by the roots. No insoluble or solid matter can be taken up by the roots—everything must be in solution in water. Water alone is often unable to dissolve the ingredients required by plants, and which are present in the soil in an insoluble form, but water containing air and carbon di-oxide acts on the insoluble matter present in the soil, and slowly renders the insoluble matter soluble, and so available for plant food. Stagnant power has not this power; hence one of the great advantages of draining soils, which I alluded to when writing on drainage in the *Queensland Agricultural Journal* for September, 1897, is plainly shown—namely, that the aëration of the soil which follows the removal of the stagnant water assists disintegration, as it supplies the necessary air and carbon di-oxide to the water, to enable it to act on the insoluble matter of the soil, and render it soluble and available for plant food.

PLANT FOODS.

Having shown how plants feed, the next thing to be considered is what foods are essential to the proper development of plants. In describing what a plant is made of, I have already stated that it consists of organic and inorganic

matter, but have not stated what *kinds* of organic and inorganic matter. It is considered by competent authorities that the following elements are essential to the proper development of all cultivated plants, and that the absence of any one is detrimental to such development:—Oxygen, hydrogen, carbon, sulphur, silicon, chlorine, sodium, manganese, magnesium, iron, calcium (lime), potassium, phosphorus, and nitrogen. Of these, the first two are always in a readily available form in water, and carbon is always present in the air in sufficient quantity, so no further notice need be taken of these three. The next six elements in the list are, as a rule, present in all soils in sufficient quantity for the growth of all crops, excepting, in certain cases, magnesium, which forms about 17 per cent. of the ash of almonds and about 13 per cent. of the ash of quinces. It is seldom necessary to apply magnesium as a manure by itself, as if the land is limed there is usually enough magnesium mixed with the lime to supply all requirements. Should it be necessary to apply magnesium as a manure, then a dressing with kainit will answer the purpose; kainit containing a large proportion of magnesian chloride. This reduces the list to five; and of these five, one—viz., iron—is usually present in sufficient quantity in most soils, excepting possibly some of our poor “wallum” soils, which are, as a rule, useless for cultivation, as, in addition to being very poor in plant food, they are usually very sour and badly drained.

Iron is present in the soil in two forms: a ferrous form which, when it is present in too great a proportion—over 1 per cent.—renders the soil valueless, as it is injurious to vegetation.

Iron in the ferrous form imparts a yellowish colour to the clay subsoils in which it is usually met with, and, when present in this form in excessive quantities, the remedy is to drain the soil, thereby aerating it, and exposing the ferrous salts to the air, when they are rapidly oxidised and converted into ferric oxide, or, as it is commonly known, iron-rust. Lime applied to the soil has a similar effect in this case to draining. The other form of iron present in the soil is the ferric oxide, or iron-rust, to which the red colour of soils is due, and it is in this state that it is taken up by plants dissolved in water. Iron is essential to the formation of the green colouring matter, or chlorophyll, of the leaf, and its absence in the soil is shown by the sickly or blanched appearance of the foliage. Should iron be found to be deficient in the soil, it is best applied in the form of ferrous sulphate (copperas or green vitriol), which is readily converted by the action of the air into iron-rust, and is then available when dissolved in water for plant food. The amount of copperas required will rarely exceed 1 cwt. per acre; in fact, more would probably do harm, and it is best applied in the early spring, just before the active growth of the tree takes place. Copperas, in addition to its manurial value, has also a value as a fungicide and destroys the spores of many fungus diseases that may be present in the soil, such as the oidium of pumpkins, black rot of the tomato, and the potato disease, as well as destroying many insects and nematodes.

The other four elements—calcium (lime), potassium, phosphorus, and nitrogen—are those to which the fruit grower or farmer has practically to confine himself in determining what manures are best adapted to the growth of the different varieties of fruits or farm crops, as they are the ingredients in which soils become most rapidly exhausted, and form by far the greater portion of the ash of all cultivated plants. They are all absolutely essential to plant growth, and when either of them is present in the soil in an insufficient quantity, either due to the natural poverty of the soil or to its impoverishment through cropping, the deficiency must be made good by the application of the necessary manure before the soil can be made to produce a satisfactory return. In fact, the fertility of a soil is calculated on the amount of these elements that it contains, so that, in describing the various manures, I will confine my remarks to these four elements, and will endeavour to show, approximately, how much of each is extracted from the soil by the principal varieties of fruits and farm crops; what manures are required to supply the deficit; and how and when it is best to apply these manures in order to obtain the best results.

CALCIUM (LIME).

Lime is essential to the growth of all plants, and constitutes from about 4 per cent. of the total ash, in the case of the apple, to as high as 30 per cent. in the ash of Californian lemons—the orange requiring rather less, about 23 per cent. These percentages refer to the fruit itself, but the wood of some of our fruit trees, notably the olive, contains a very much greater proportion, for, whereas the proportion of lime in the fruit of the olive is only about 16 per cent. of the total ash, that of the wood is about 60 per cent. Considerable quantities of lime are also required for the successful growth of peas, beans, clovers, lucerne, potatoes, wheat, and other cereals. In the case of pulses, it and potash may be considered to be the dominant ingredients. Soils that produce white clover, burr clover, and variegated thistles in profusion are rich in lime, as also is water that grows a quantity of watercress. In the Western portions of the colony land growing *gidya* is also rich in lime, the ash of this tree containing over 90 per cent. Most of our soils contain lime in sufficient quantity for all crops, but there are others again in which there is a marked deficiency. Where these latter occur, lime must be applied as a manure, and for this purpose from 1 ton to 1½ tons per acre is sufficient; but if, in addition to the soil being deficient in lime, it is sour and unworkable, a much larger amount—from 4 to 6 tons to the acre—must be applied. Lime owes its efficiency not only to its value as a manure but more especially to the effect it has on the soil of sweetening it, and rendering it more friable, and consequently more easily worked; and in addition it acts beneficially in that it renders a portion of the unavailable potash of the soil available for plant food. It also acts on the injurious salts of iron present in the soil—oxidises them, converting them into iron-rust, which, except when it is present in the soil in any excessive quantities, is not injurious to vegetation. Its sweetening effect is due to the fact that when it comes in contact with the free acids in the soil it neutralises them. If the lime is required by the soil to supply its natural deficiency, it may be applied in the form of chalk—ground shells, or coral, or any other form of carbonate of lime—or as caustic lime, formed by the burning of any form of carbonate of lime; but if its mechanical, rather than its manurial, qualities are required, then it should always be applied in the form of hydrate of lime, which is formed by allowing the caustic lime to slack in the field or orchard in the following manner:—Heaps of caustic lime, containing three to five bushels, are placed at convenient distances for distribution, and are covered with 6 inches of soil so as to exclude the air. The heaps are allowed to remain two weeks or longer, when the lime will be found to be in a fine powder and fit for spreading. Lime applied in this form has a much more beneficial effect in breaking up and sweetening the soil than if applied in an air-slacked condition; as air-slacked lime is simply carbonate of lime, its original condition before burning. Lime is best applied during the autumn or winter, and it should be evenly distributed over the land and lightly ploughed in. If ploughed in too deeply, a quantity is sure to be lost, as it always tends to sink in the soil. Lime should always be used by itself, as if used in conjunction with other manure it will cause the whole of the nitrogen present in the manure to be thrown off in the form of ammonia gas, and so become lost. Where the land is regularly manured with bonedust or superphosphates, there is always enough lime present in these manures to meet the requirements of any crop without special recourse being had to liming by itself, but where the soil is naturally deficient in lime a good manuring of lime should be given first, and then subsequent manurings of bones or superphosphates will generally suffice without any further application. Lime is obtained by plants in the form of carbonate, which is dissolved by water containing carbon di-oxide in solution, and is thus absorbed by the roots.

I have mentioned the large proportion of lime found in the ash of the wood and fruit of the olive, showing that this element is essential to the growth of this particular fruit, and this is clearly exemplified by the growth olives are making both at the Westbrook and Hermitage Experiment Farms on the

Darling Downs, where the soil is comparatively rich in calcareous nodules. The presence of an ample supply of lime in the soil also renders the sandy, loamy country lying immediately to the west of Warwick admirably adapted to the growth of almonds, a crop that should do and pay well in this particular district.

The application of lime as a manure at Redland Bay does not appear to have had any material effect on the bananas to which it was applied, showing that the soil has sufficient of this plant food. It has, however, produced a good mechanical effect in that the soil is easier to work and scours better. This is a decided advantage, as the bad scouring properties of all our red volcanic fruit soils render them more or less difficult to work.

POTASSIUM (POTASH).

In the analyses of the ash of all farm crops and fruits, potash occupies a prominent position, showing how necessary it is that the soil should contain a sufficient supply of this essential plant food in an available form. In the case of fruits, pulses, root crops, and some vegetables, potash may be said to be the dominant constituent, as the ash of the fruit of the peach contains as high as 75 per cent. of potash, and that of several other fruits range from 50 per cent. upwards, that of the farm crops mentioned from 30 to 40 per cent., and vegetables up to as much as 50 per cent.

In addition to the potash contained in the fruit, farm crops, or vegetables that are sold off the farm, and the loss of which must be made good unless the soil is naturally rich in this particular plant food, the roots, leaves, and branches contain more or less potash, which is necessary for their proper development. It must be supplied by the soil in the first place, but is, as a rule, eventually returned to the soil, so that it is not actually lost, as is the potash contained in the produce that is sold off the orchard or farm. At the end of this article I am giving a short tabulated analysis of the ash of our principal fruits, vegetables, and farm crops, showing the amount of potash, nitrogen, and phosphoric acid removed from the soil by 1,000 lb. of each particular product.

These analyses have been obtained from a number of sources, both European and American, and though the analysis of any particular product is found to vary considerably, according to the conditions under which the crop has been grown—such as soil, climate, rainfall, &c.—as well as to the particular state of ripeness at the time of the analysis, the table, though not to be considered absolutely accurate under our local conditions, will yet be found to be of considerable value when determining the particular manure or manures required by any special fruit, vegetable, or farm crop.

Most of the fruit and farming soils of this colony, especially those of alluvial, basaltic, granitic, or volcanic origin, are usually sufficiently rich in potash not to need any special manuring, as the supply is ample for all crops for years to come; but there are other soils of sandstone origin that are more or less deficient in this plant food. Such soils would be greatly benefited by the application of potash manures, especially for the growth of potatoes, sweet potatoes, mangolds, beetroot, tomatoes, and all kinds of fruit.

It is not a difficult matter, as a rule, to tell whether a soil is deficient in potash or not, if you will carefully note the crops that do well, those that do badly, and the weeds or native plants that are most abundant. For example, where you find a soil in which tomatoes, blackberries (*Solanum nigrum*), Cape gooseberries, inkweed, clovers of kinds, wild vetches, crow's-foot, and wild carrots grow profusely, the soil is rich in available potash. Again, sandy, loamy ground that grows good crops of sweet or English potatoes, peas, and beans, without special manuring, is rich in potash; but where such a soil does not grow these crops or tomatoes, then potash is necessary. Heavy soils that grow good mangolds or sugar beet are also usually rich in potash. Fruit trees growing on poor, sandy soils, if requiring potash, will show same by a deficiency of colour in the foliage and also by a slight variegation. From the experiments conducted by the Department of Agriculture at Redland Bay, I cannot

see any appreciable results from the application of potash salts to the soil there, either in the case of pines, bananas, pulses, corn, or sorghum—though they certainly improved the colour of citrus trees. Generally speaking, I do not consider that the application of potash as a manure will be found to be of any great benefit to the greater portion of Queensland soils, though in the case of thin soils—where it is found to be deficient—its application as a manure will have a rapid and marked result, both on fruits, vegetables, and farm crops.

In many of our soils there is abundant potash, which is, however, in a more or less unavailable form, and this supply can, as a rule, be liberated by the application of lime to the soil, as previously mentioned under the heading of "lime," or by the growing of deep-rooting pulses that are valuable for green-crop manuring—a matter that I purpose dealing with fully later on.

There are three great sources of potash, viz.:—Granite, which consists of quartz, felspar, and mica; and it is the felspar, of which there are several varieties, that contains the potash, one variety (orthoclase) containing as much as 16 per cent. The second great source of potash is salt water, which contains about 7·6 lb. of potassium chloride in 10,000 lb. of sea water, so that the supply from this source alone is inexhaustible. The third great source, and the one from which we obtain our supply, is the great deposit of potassium salts that are found near Strassfurt, in Germany, where the supply is enormous. From the crude salts we obtain kainit, which is largely used as a manure, and which contains, in good samples, about 25 per cent. of sulphate of potash, which is equivalent to about $12\frac{1}{2}$ per cent. of potash (K_2O), the value of which at present prices is 5s. 4d. per unit—that is to say, a manure containing 1 per cent. of potash is worth 5s. 4d. per ton, or a manure containing 10 per cent. is worth £2 13s. 4d. per ton. Kainit at present price is a very dear form in which to buy potash, as it costs about £4 per ton, whilst sulphate of potash containing 52 per cent. of potash is worth £13 15s. per ton, and muriate of potash containing 61 per cent. of potash is also worth £13 15s. per ton, so that the cost per unit is less than that in the case of kainit, besides the freight and handling on an equal quantity of available potash is much greater in the case of kainit than it is in that of the more concentrated manures.

In addition to these sources of potash, there are two others, viz.:—(1) What is known as Australian potash, a natural potash salt found in this colony and containing 25 per cent. of potash; though not offered for sale in Queensland, as far as I am aware, it is now quoted on the Sydney market at £6 per ton, at which rate, taking into consideration the 8 per cent. of insoluble phosphates combined with the potash, and worth 2s. per unit, it is the cheapest form of potash available, costing only 4s. 2d. per unit. (2) Nitrate of potash, or saltpetre, which is valuable both on account of the potash and nitrogen that it contains. As a general rule it is, however, too dear to use, but in special crops, such as asparagus, it is found to be a very valuable manure.

The ashes of many trees are also rich in potash, but only when they are grown on soils containing a sufficient supply of potash. The ash of trees growing on poor sandstone soils seldom contains much potash, and is often of little value as a manure. When used in conjunction with other manures, which is in many cases desirable, sulphate of potash should be used; also, when the question of railway carriage or long cartage is to be considered, it is preferable to kainit, as it only takes one-fourth the amount.

Sulphate of potash is most beneficial when applied to the trees early in spring, just as they are starting into growth, as being in a soluble form it is readily assimilated by the tree. If the soil is of a very open porous nature, it is better to apply the manure in two or three dressings at intervals rather than all at once, as, if applied all at once and heavy rains set in, a considerable portion will be leached out of the soil and lost. This applies equally when soluble phosphatic or nitrogenous manures are applied to light porous soils.

From 1 cwt. to 2 cwt. per acre of sulphate of potash is about the quantity required to produce a good crop of grapes, plums, and prunes, and though oranges and lemons contain rather less potash in proportion than these fruits, yet the

much larger weight of fruit produced in good bearing orchards more than makes up for the deficiency, and the call on the potash is often as great, if not greater, than these fruits, prunes excepted. If kainit is used in the place of sulphate of potash, from 6 cwt. to 8 cwt. per acre will be necessary. In most cases potash manures are most advantageously applied in conjunction with phosphatic and nitrogenous manures, as few soils simply require potash without the other ingredients.

The composition and application of manures required for different crops will be dealt with later on, when the two remaining essential elements of plant food have been described.

PHOSPHORUS.

Phosphorus, or, as it is generally spoken of in manuring, phosphoric acid, is essential to the growth of all fruits, occurring in the seeds in far larger amounts relatively than in the flesh, in which respect it is similar to nitrogen. It is owing to this that the thinning of stone fruits has such a beneficial effect on the tree, in addition to the mere increase in size of the fruit allowed to remain. As when a peach or an apricot is allowed to bear an excessive number of small fruits, the crop, besides being comparatively worthless, will have so weakened the tree, and made such a call on the soil, that it will take a year's rest to recuperate, whereas, where judicious thinning is practised, the tree will produce annually a greater weight of first-class fruit that will do less damage to the tree and soil than the great number of small worthless fruit and the great crop of stones.

Fruits do not take anything like as much phosphoric acid out of the soil as they do potash; nevertheless, as there is a very much smaller supply of available phosphoric acid in most soils than there is potash, it is usually the first inorganic plant food to become exhausted.

Phosphoric acid is always found present in large quantities in the seeds of plants; hence the growing of wheat, barley, oats, beans, or maize for grain year after year, without manuring, rapidly reduces the available proportion of this plant food in the soil. Any deficiency of phosphoric acid in the soil is shown by the failure of the crop to produce seed. Thus wheat, barley, oats, sorghum, or corn may grow plenty of fodder, but at the same time produce no grain, and potatoes and root-crops may produce plenty of tops, but no tubers or roots; or a fruit tree, owing to an insufficient supply, may only bear a small crop of fruit, and that of poor quality, so that it is not usually a difficult matter to determine whether a soil requires a dressing of phosphates or not.

Phosphoric acid is derived principally from the following sources:—Bones, phosphatic guanos, coprolites, and basic slag. As far as this colony is concerned, bones are practically the only source to be considered, though basic slag is proving a cheap source in England, but is relatively dearer than bones in this colony. Bones may be either applied in the form of bonemeal, when the phosphoric acid contained in them is combined with lime in an insoluble form that is only slowly available for plant food by being rendered soluble by the carbon di-oxide in the water of the soil, or they may be applied in the form of superphosphate, when the phosphoric acid is in a soluble and readily available form for plant food.

Superphosphate is formed by the action of sulphuric acid (oil of vitriol) on bones, or any other form of insoluble phosphate, converting the insoluble into soluble phosphates. The relative value of these two forms of phosphoric acid is estimated at 2s. per unit for the insoluble, and 5s. 4d. per unit for the soluble. Where a rapid growth and a quick return is required, as in the case of vegetables, the soluble form should be used, but where a lasting effect is required use the insoluble. In the case of fruit trees the two forms are best used together, so as to produce the best effects, as the soluble phosphates stimulate a rapid growth, and when their effect is past the trees have the more lasting form to fall back on. It is often a good plan to apply the insoluble form during the autumn, so that it may become slowly acted on in the soil, and be ready for the

plant-growth in spring; but the soluble form, or superphosphates, should never be applied except at a time that the plant can absorb them—that is to say, during a period of active growth.

In addition to the insoluble and water soluble phosphates or superphosphate, there is a third form which is more active than insoluble and less active than superphosphate, which was known for some time as bi-phosphate or reduced phosphate, but which is now known as citrate soluble phosphate, and is given a value of 4s. 6d. per unit.

Personally, I do not object to a certain proportion of citrate soluble phosphate in a phosphatic manure, but look upon it as an advantage in the case of slow-growing crops rather than a disadvantage. Except with excessive rains or very sandy porous soils, phosphates are not often washed out of the soil, but are retained till assimilated by the tree or plant to which they have been applied. The quantity of phosphoric acid removed by 1,000 lb. of any given fruit, vegetable, or farm crop can be seen by referring to the table at the end of this article; and the quantities required for different fruits and crops used either by itself or in conjunction with potash or nitrogen, or both, will be dealt with later on when treating of the composition and application of manures.

NITROGEN.

We now come to the last of the essential plant foods that we have to consider, and, though last, by no means the least important or least expensive to supply to the soil when it is present in a deficient amount, for though about four-fifths of the air consists of nitrogen, still it is not available for plant food, except in the case of certain varieties of leguminous plants. In fact, it is the most expensive element we have to supply to the soil, its value at the present time being about 10s. per unit. Nitrogen occurs in all plants, and is absolutely essential to their proper development. It occurs principally in the albuminous matter of fruits, of which it forms about one-sixth, and by far the greater portion of the albuminous matter of fruits is contained in the seeds or kernels, and not in the flesh, hence the value of thinning, as previously pointed out, as by judicious thinning you produce as large an amount of flesh and as small an amount of seeds (stones) as possible, thereby greatly reducing the amount of nitrogen required.

Only a comparatively small proportion of the nitrogen contained in plants is present in the form of nitrates in the ash, the bulk being in the form of albuminoids or flesh-forming matter, which form a large proportion of the seeds of our farm crops, especially of pulses. It is also present to a considerable amount in fodder plants of all kinds, especially in all plants of the pea family, which includes lucerne, clover, cow peas, peas and beans of all kinds.

Nitrogen occurs in the soil in the form of nitrates which are found in conjunction with the organic matter of the soil, which has the power of converting ammonia, the form in which nitrogen is usually applied to the soil, into nitric acid, which forms in conjunction with the potash and soda, &c., in the soil what are termed "nitrates," and these nitrates are taken up by the tree and assimilated.

There are many sources of nitrogen, but of these only three may be considered as of paramount importance in this colony, viz.:—Sulphate of ammonia; dried blood; and nippo, a by-product from boiling-down and meat-works containing about $12\frac{1}{2}$ per cent. of nitrogen. Nitrogen may also be obtained in the form of nitrate of soda and nitrate of potash, which, though they are more readily available as plant food than sulphate of ammonia, as they have not to undergo the process of nitrification, are still too dear, when compared with sulphate of ammonia, to be used extensively. Nitrogen also occurs in smaller proportions in many substances that are used as manures, and of these guano, especially Peruvian guano, was at one time the great source of the supply of this material, but the deposits are now pretty well played out, and are of more value for the phosphates than the nitrogen they contain. Bonemeal also contains from 2 to 4 per cent. of nitrogen, the amount depending on the amount of gluey

matter that is mixed with the bones proper; and fowl manure, stable manure, the droppings of all animals, especially sheep, nightsoil refuse, skin and hair, and several other ingredients contain a small proportion of nitrogen, and are valuable as manures. But, as I mentioned at first, there are three main sources of supply—sulphate of ammonia, dried blood, and nipho. Sulphate of ammonia is obtained as a waste product from the gasworks, and, though costing £10 10s. per ton, it is the cheapest form in which nitrogen can be supplied to the land. Sulphate of ammonia acts very rapidly on any trees or plants to which it is applied, producing a vigorous growth, and imparting a dark-green, healthy colour to the foliage. It should never be applied except when the tree is in active growth, as, on account of its solubility, if applied at any other time, it is apt to be washed out of the soil, especially if the soil is of a porous nature, when it is always advisable to apply it to the trees at two or three dressings rather than all at once. Sulphate of ammonia is an exceedingly stimulating manure, and it has the power of forcing the soil—that is to say, it produces a very vigorous leaf growth, which, in its turn, makes a very greatly increased call on the roots, which again take from the soil an increased amount of plant food, so that it is not advisable to use sulphate of ammonia unless you feed your soil with the necessary potash and phosphoric acid required by the tree. Used alone, it will so impoverish your soil that finally it will produce nothing—a result that I have noted when in Scotland, where, through the continual manuring of the soil with nitrate of soda (the action of which is similar to sulphate of ammonia), and by its use forcing big crops which were sold off the land, I have seen soils completely played out that took years of careful cropping and manuring to bring into fair heart. Used judiciously, sulphate of ammonia is one of the best manures that can be applied to an orchard, especially if the trees are a bit sickly and off, when, if the roots are sound, and the trees are not showing badly through want of drainage, they may be brought round into vigorous health, provided, when they are started, that other manures are available from which the trees may obtain the necessary food wherewith to maintain their increased growth.

In dried blood and nipho the nitrogen is not in as readily available a form as in the sulphate of ammonia, as it is present in the form of albuminous matter, which has to be converted first into ammonia, and then into nitrates, before it can be used by plants. Its action is thus much more lasting than that of sulphate of ammonia, as it continues to supply nitrogen to the plant for a considerable time. For this reason nitrogen from organic sources is considered to be of a slightly higher manurial value than that obtained from inorganic sources. Thus sulphate of ammonia should be used in conjunction with the soluble phosphates and potash to start the growth, and dried blood or nipho used in conjunction with bonemeal or other slowly available phosphate to supply the plant food when the more readily available and soluble foods have become exhausted. Before I conclude speaking about nitrogenous manures there is one point I should like to call attention to, and that is that many substances, such as refuse skin, hair, and leather, though containing often a considerable amount of nitrogen, as shown by analysis, are yet of very little value for manure, and this is due to the fact that the nitrogen is in an unavailable form, and only becomes available very slowly in the soil.

There is one other very cheap and efficient way of applying nitrogen to the soil, and it is the one that is given least attention to—viz., green manuring. As I have already mentioned, leguminous plants have the power of assimilating nitrogen from the air and of storing it up, so that if these plants be sown in the orchard, and ploughed in when they contain the most manurial matter, which is just before the pod ripens, the soil will be enriched by the amount of the nitrogen that has been obtained by the plants from the air. The question of green manuring is, however, one of such importance that it will be dealt with fully later on.

Probably no plant food is so generally deficient in Queensland soils as nitrogen, especially in soils that have been under crop for a number of years.

This has been especially noticeable at the Redland Bay Experiment Orchard, where the humus or vegetable matter containing the nitrogen in the soil has been largely depleted by continuous cropping and heavy rains, which have washed it out of the soil. The application of nitrogenous manures to this particular soil has had a very marked effects on all crops, especially on pines, fruit trees, oats, corn, sorghum, and vegetables. The want of nitrogen in a soil is easily detected, as nothing seems to thrive when it is absent—all grain crops have a sickly yellowish or purplish colour; corn and sorghum produce very little fodder; vegetables do badly, and fruit trees of all kinds have a more or less unhealthy and starved appearance, the foliage is usually yellowish or light-coloured, and the growth of young wood poor. The importance of providing a cheap supply of nitrogen is thus clearly shown, and from the results obtained so far at Redland Bay I feel confident that the growing of various pulses and ploughing same in will be found to be the cheapest and most efficacious way of bringing soils such as those described back into a state of the highest fertility, and capable of producing paying crops of fruit, vegetables, or farm produce.

Viticulture.

SUMMER PRUNING.

By E. H. RAINFORD,
Viticultural Expert.

VERY shortly that part of the cultivation of the vine known as summer pruning will be required in the vineyard, and a few hints on the subject may be acceptable to some of our viticulturists. Summer pruning may be divided into three separate and distinct operations, which will be dealt with seriatim.

1. *Disbudding*.—The operation known as disbudding is very necessary to the welfare of the vine, as it consists in relieving it of all the vegetation which carries no fruit, with a few exceptions; but it is in the choice of these exceptions that the judgment must be exercised. All vines, some more than others, put out every spring a number of suckers and water shoots that carry no fruit, and if not removed diminish the vigour of the vine and affect its fertility next season. Moreover, these shoots, if not summer pruned, will have to be winter pruned, and the latter operation leaves a scar far more difficult to heal than the former. All suckers and water shoots from the stock should be removed unless it is required to reform the stock, in which case the shoot best placed is left for that purpose, and the others removed. In cases where a vine has been badly pruned and allowed to straggle too far, with consequent weak growth from the spurs, it is often advisable to leave a strong well-placed water shoot from the stock, cutting the cane back next winter, and subsequently reforming the vine on it. Occasionally a vine, both bush and trellis pruned, will produce each spring a large number of water shoots, but with a weak vegetation from the spurs. This shows that the sap circulates with difficulty at the spurs, probably from bad pruning and dead wood. When this occurs, choose the best placed water shoot to reform the vine next season, as mentioned above, removing all others from stock.

It often happens that a bud will start at the base of a spur that has already become elongated and knotty; if so, be careful to preserve that shoot, as it will be useful next pruning for reforming the spur. As new wood is always more productive than old, any shoot that can be utilised for that purpose should be

carefully preserved. When vines are pruned goblet fashion, preserve those shoots which will fill up a gap in the spurs or improve the shape of the vine, and disbud all others that carry no fruit.

The correct time for this operation is just before flowering. Do not delay it too long; otherwise the removal of the shoots will cause a scar or wound more difficult to heal.

With disbudding is connected the operation of leaf-stripping, which, although useful in cases, should be very cautiously performed. During the time of flowering, aeration is necessary for the fruit to set well, and when the flower is thickly set round with leaves a few of these may be advantageously removed; but beware of overdoing it, and leaving the flower too much exposed to the sun's rays—better too little than too much.

2. *Pinching*.—This operation is advantageous, for two purposes—firstly, to assist the setting of the fruit; and, secondly, to balance the growth from the spurs. Some vines are very bad for non-setting their fruit, and some will become so when planted in certain soils and situations. The cause is to be found in the extreme vigour of their vegetation, which has the effect of disorganising the fecundation of the flowers. There are other causes for non-setting, but at present only this is under consideration. When a vine with strong vegetation is a persistent non-setter, the shoots should have the extremities nipped off with the thumb-nail at flowering time. The check given to the growth of the shoot greatly assists the setting of the fruit. Before long, a number of laterals will appear. All these should be removed with the exception of the upper one, which will continue the growth of the shoot as if it had not been pinched.

When vines are pruned on the uni-lateral and bi-lateral cordon system, or on the single and double fruit-rod systems, the extreme spurs or eyes vegetate first, and are liable to absorb the bulk of the sap and prevent some of the other eyes bursting. Pinching these shoots is then advantageous, as by checking their growth the other eyes are able to burst and make a normal vegetation. But here the pinching must be done earlier, when the shoots are a few inches long and the delay in the bursting of the other buds is becoming apparent. The same subsequent removal of laterals should be practised as for non-setting. Except in these two cases, do not pinch.

Topping.—If there is one thing more than another harmful to the grape crop in Queensland, it is the indiscriminate and irrational system of topping indulged in. The idea popularly entertained that it forces the sap into the bunches is utterly erroneous, and in most cases the practice impairs the quality of the grape instead of improving it, especially when, as has been seen by the writer, the shoots are lopped off just above the bunch. Leaves are the manufacturers of those materials which compose fruit—starch, glucose, acids, &c. The leaf-cells unite the atoms of carbon, oxygen, hydrogen, &c., to form those substances, and they are circulated by the sap to those various parts of the vine where they are required. To lop off the leaves is to lop off the factory. But, it is argued, new leaves come on the laterals; if that is the object, the primary leaves might just as well have been left. Besides, adult leaves are supplying the plant with food, and young leaves are dependent for this upon the old until they are adult themselves, and able to assist in supplying the plant; so there is a loss instead of a gain. When, as often happens, the topping is repeated several times, there is a constant drain upon the plant for food for the young leaves. Where, then, does the gain to the grapes come in? Again, this severe topping frequently leaves the bunches exposed to the sun's rays, which, during hot westerly winds, are powerful enough to paralyse the action of the cells; hence—wilting and uneven ripening. Grapes in Queensland require shade to ripen well, not sun; so do not top unless compelled to do so. Where vines are pruned bush fashion and cross-cultivated, vigorous vines will require some topping, but very little even then, if tied to stakes sufficiently high. When the crop is off, the topping is less harmful, but again the writer says—DON'T TOP UNLESS COMPELLED TO DO SO.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order GUTTIFERÆ.

CALOPHYLLUM, Linn.

C. costatum, Bail. A lofty tree, the branchlets not prominently angular, puberulent. Leaves oblong, tapering much towards the base, 2 to $2\frac{3}{4}$ in. long, 1 to $1\frac{1}{2}$ in. broad; sometimes very shortly and broadly acuminate, margins somewhat wavy, lateral nerves numerous, oblique, midrib channelled above, prominent and more or less hairy on the underside; petioles about $\frac{1}{2}$ in. long, flattened, and puberulent. No flower seen. Fruit picked off the ground under the trees, roundish-oval, pointed at each end, the largest nearly $1\frac{1}{2}$ in. long and 1 in. diameter; when dry, the epicarp showing many prominent ribs.

Hab.: Evelyn, J. F. Bailey.

Order TILIACEÆ.

TRIUMFETTA, Linn.

T. nigricans, Bail. Plant erect, 2 to 3 ft. in height, clothed in most parts with short stellate hairs all round the stem and branches, but frequently more dense on one side than on the other; very dense on the back of the leaves. Branches nearly terete, stipules rather persistent, narrow, 4 lines long. Leaves ovate-lanceolate, palmately 3 to 5-nerved, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. broad, coarsely serrate. Petioles slender, 1 to $1\frac{1}{2}$ in. long. Flowers yellow, solitary, or few in a pedunculate umbel. Bracts filiform, 2 lines long. Pedicels about as long as the bracts. Buds narrow-oblong crowned by the spreading sepal appendages. Sepals linear, 4 lines long without the thread-like appendages. Petals spatulate, shorter than the sepals. Stamens 15 to 20, filaments glabrous. Style sulcate, glabrous. Ovary setose 4-celled, 2 ovules in each cell. Fruit about 4 lines diameter, dark-coloured, 4-celled, 2 seeds in each cell; outside covered with slightly hairy hooked setæ about 4 lines long, the sharp hook at the ends often of lighter colour, glabrous between the setæ except for a few stellate hairs. Seeds oval, rough.

Hab.: Herberton and Tully River, J. F. Bailey. This plant is likely to become a pest, and should be included in "Noxious weeds to be destroyed." The fruit very dark or blackish on the specimens received.

Order MELIACEÆ.

FLINDERSIA, R. Br.

F. Chatawaiana, Bail. (After the Hon. J. V. Chataway, M.L.A.) Aboriginal names: "Narroo," Herberton district; "Arrago," Tully River. Red Beech or Cardwell Maple. A large tree with a trunk-diameter of from 3 ft. to over 4 ft. Leaves opposite, petioles and rhachis more or less sharply angular; leaflets usually 7, oblong falcate, obtuse or with a more or less acuminate obtuse point, sometimes very oblique at the base, 3 to $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. broad, underside somewhat pale; primary lateral nerves rather distant, 9 or 10 on each side of rhachis; petiolules slender, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Panicles rather large and spreading; no flowers available for examination. Fruit 3 or more inches long, oblong, but tapering at each end, pentagonal, prominently marked with dark mussel-shaped scars, which gives to the fruit somewhat the appearance of a fir-cone. Seed winged all round, including wing about $2\frac{1}{4}$ in. long, $\frac{1}{2}$ in. broad.

Hab. Cardwell to Herberton, J. F. Bailey.

F. Mazlini, Bail. A large tree, stem-diameter exceeding 2 ft. Leaves glabrous deep-green, usually opposite, but here and there alternate, leaflets 3 or 5, ovate-lanceolate or oblong, with more or less acuminate blunt points $2\frac{1}{2}$ to 4 in. long, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. broad, thin-coriaceous, lateral-primary nerves thin, close and rather dark-coloured. Petioles 1 to 2 in. long, rhachis about the same length, petiolules 2 to 4 lines, all slender. Panicles of few branches about as long as the leaves. No flowers available for describing. Fruit oblong, muricate, 2 to $3\frac{1}{2}$ in. long, the protuberances very irregular as to size, glossy, slightly tapering at the base, the valves protruding at the end of the fruit and forming a 5-rayed star. Seeds winged all round, often solitary on one side of the placenta, and 2 or 3 on the other, the single one including wings $1\frac{1}{2}$ in. long, when 2 or 3 about half that length.

Hab.: Evelyn, near Herberton, *J. F. Bailey*.

Order CELASTRINEÆ.

SIPHONODON, Griff.

S. membranaceum, Bail. A tree of 60 or more feet in height, the branchlets rather slender and often deeply striate. Leaves oblong-lanceolate, membranous in comparison with those of the other Queensland species, 4 to 6 in. long, 1 to $1\frac{1}{2}$ in. broad, the margins somewhat wavy; apex acuminate, slightly cuneate at the base; petioles short. Flowers small, few in axillary cymes. Fruit yellow, globose-turbinate, attaining a diameter of 2 in.; smooth, more or less sunk at the apex, and often deeply 5-sulcate, soft and the inner substance mealy, but if kept a few months becoming quite hard as in the other kinds.

Hab.: Evelyn, Herberton district, *J. F. Bailey*.

The differential characters of the Queensland species—

Leaves coriaceous, pale-coloured, oblong, obtuse, 3 to $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, unequal sided and tapering much towards the base. Fruit usually oval, about 1 in. long 1. *S. australe*.

Leaves coriaceous, pale coloured, obovate, $2\frac{1}{2}$ in. long, 2 in. broad, tapering and equal sided at the base. Fruit nearly globular, $1\frac{1}{2}$ in. long *Var. at Mt. Perry*.

Branches drooping. Leaves falcate, about $5\frac{1}{2}$ in. long, 1 in. broad, texture thin, pale-coloured, obtuse, tapering at the base. Fruit globose, about, 2 in. diameter 2. *S. pendulum*.

Leaves of thin texture, $4\frac{1}{2}$ to 6 in. long, 1 to $1\frac{1}{2}$ in. broad, apex sharply acuminate, slightly cuneate at the base. Fruit globose-turbinate, 2 in. diameter, smooth, more or less sunk at the apex, and often deeply 5-sulcate 3. *S. membranaceum*

Order SAPINDACEÆ.

NEPHELIUM, Linn.

N. Callarrie, Bail. (Aboriginal name of tree at the Upper Barron River.) A graceful erect tree about 50 feet high, in all parts except the upper side of leaflets thinly covered with a light-coloured pulverulence. Leaves pinnate; leaflets petiolulate, oblong-lanceolate, alternate, 5 to 13, thin coriaceous, 5 to 9 in. long, $1\frac{1}{2}$ to 2 in. broad, primary nerves very close, but faint, not more prominent than the close reticulation which is plain on either side, upperside green, glabrous, under side almost white, margins entire, wavy. Panicles in the upper axils, erect, 6 to 9 in. long, with few spreading racemose branches, the flowers small in cymes or clusters of about 3 on short branchlets, almost sessile, calyx silky-hairy, about 2 lines diameter, lobes 5, broad. Petals 5, rudimentary,

obtuse, tapering each way from the centre. Stamens 8, slightly exserted, filaments hairy, broadening towards the base, very narrow under the anther, ovary silky, tapering from base to the 2 recurved stigmatic lobes.

Hab. : Mulgrave River, *Bellenden Ker Expedition*, 1889. Upper Barron River, *J. F. Bailey*, June, 1899.

Order LEGUMINOSÆ.

PULTENÆA, Sm.

P. Millari, *Bail.* (After T. Barclay Millar.) A shrub of a few feet, the branches angular, silky, pubescent, with closely appressed white hairs. Leaves scattered on short silky-hairy petioles, cuneate, 4 to 7 lines long, rounded at the top and 2 to 3 lines broad, lateral nerves regular and rather distant, the prominent midrib ending in a minute recurved point; bright glossy on the upper, pale-hoary on the underside. Stipules long as the petioles, dark with spreading recurved fine points and ciliate margins. Flowers in the axils near the ends of the branchlets on very short pedicels, solitary. Bracts none. Bracteoles inserted on the calyx-tube at the base, scabrous, narrow-lanceolate, dark, long as the calyx-tube. Calyx nearly rosy-white, silky outside, parallel-reined inside, about 3 lines long, the lobes of equal length with the tube, very narrow, the 2 upper ones united above the middle. Standard broader than long, 4 lines broad, claw about 1 line, wings narrow with claw $3\frac{1}{2}$ lines long; keel still shorter, dark-purple. Ovary silky, tapering into a flattened style. No pods on the specimens collected.

Hab. : Herberton, *J. F. Bailey*.

KENNEDYA, Vent.

K. exaltata, *Bail.* Pod straight, 4 in. long, $\frac{1}{2}$ in. broad, convex on both sides, silky outside, glabrous inside with transverse partitions slightly constricted between the seeds; seeds 6 or 7 in each pod, almost lens-formed, about 4 lines diameter, light-brown, strophiole not large.

Hab. : Atherton, *J. F. Bailey*.

Order MYRTACEÆ.

EUGENIA, Linn.

E. gustavioides, *Bail.* (From the general contour of the matured fruit resembling that of a *Gustavia*.) A very large glabrous tree with a straight trunk several feet in diameter; branchlets more or less compressed. Leaves thin coriaceous, about 5 in. long, $2\frac{1}{2}$ in. broad, oblong-lanceolate, the apex often, acuminate and twisted, base cuneate; midrib sharply prominent; lateral nerves slender, looping far within the margin and again once or twice between that and the edge of the leaf, petiole about $\frac{1}{2}$ in. long. Fruit globose, attaining 2 in. diameter, rind of a dark colour, hard and dry, crowned by the wide circular scar of the calyx-rim; endocarp inseparable from the rind, containing a solitary globose seed.

Hab. : Near Lake Barrine, *J. F. Bailey*.

Order APOCYNACEÆ.

OCHROSIA, Juss.

O. Newelliana, *Bail.* (After Mr. J. Newell, M.L.A.) A tall spreading shrub, dichotomously branched. Leaves opposite, or those at the end of the branchlets 3 in a whorl, oblanceolate-oblong; frequently with a more or less developed point, tapering much towards the short petiole; lateral nerves parallel, numerous, almost horizontal. Flowers small, on short peduncles in the forks of the branchlets (flowers not in a fit state for describing). Drupes oval, acuminate, orange-yellow, 1 in. long, $\frac{1}{2}$ in. broad; usually 2 at the end of the peduncle, maturing 1 carpel each. Seeds 1 in each carpel.

Hab. : Atherton, *J. F. Bailey*.

Order LOGANIACEÆ.

FAGRÆA, Thunb.

F. Muelleri, Benth. Corymbose panicle of few very fragrant flowers at the ends of the branchlets. Pedicels about $\frac{1}{2}$ in. long, with 2 small bracteoles near the top. Calyx-lobes broad, 2 lines long, very obtuse and often split at the ends. Corolla-tube expanding upwards, about 8 lines longer than the calyx; lobes obtuse, about 4 lines long, $2\frac{1}{2}$ lines broad. Filaments 5, filiform, shortly exerted.

Hab. : Evelyn, *J. F. Bailey*. The above completes the description of this rather rare shrub.

Order PIPERACEÆ.

PIPER, Linn.

P. (Chavica) Rothiana, Bail. (After Dr. W. E. Roth, to whom I am deeply indebted for specimens of our Northern plants and their aboriginal names.) A tall climbing plant adhering to tree trunks by adventitious roots, like Ivy. Leaves ovate-acuminate, 4 to 6 in. long, 2 to $2\frac{1}{2}$ in. broad, rounded or slightly cordate at the base, usually 5-nerved; petiole stout, about 4 lines long, hairy as well as the lower parts of the nerves. Spikes (only fruiting spikes obtained) nearly horizontal from the branch, 3 to 4 in. long, not very stout, on peduncles of about $1\frac{1}{2}$ in. The dried fruitlets $\frac{3}{4}$ line long. Aboriginal name, "Chib-bi."

Hab. : Atherton, *J. F. Bailey*.

Order PROTEACEÆ.

HOLLANDÆA, F. v. M.

H. Lamingtoniana, Bail. (Named in honour of His Excellency Lord Lamington, who has taken a deep interest in the Queensland flora.) A handsome tree of medium size; the branchlets, petioles, leaf-nerves, and inflorescence more or less densely clothed with short bright ferruginous hairs. Leaves roundish-ovate, cuneate at the base, 4 to 6 in. long, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. broad, the margins with distant small glandular teeth, the upper surface dark glossy-green, veins and veinlets hairy on the underside; primary nerves rather distant, prominent. Racemes axillary towards the ends of the branchlets, erect, rather stout, $2\frac{1}{2}$ to 4 in. long on short petioles; bracts minute, flowers dense, the pedicels more or less connate, about 2 lines long. Perianth 8 to 9 lines long, straight, the segments much curled back after expansion. Anthers linear, apiculate, light-coloured like the inside of the segments. Style capillary, nearly as long as the segments; stigma linear. Ovary silky; hypogynous scales free, oblong, membranous, light-coloured, and hairy. No fruit to hand.

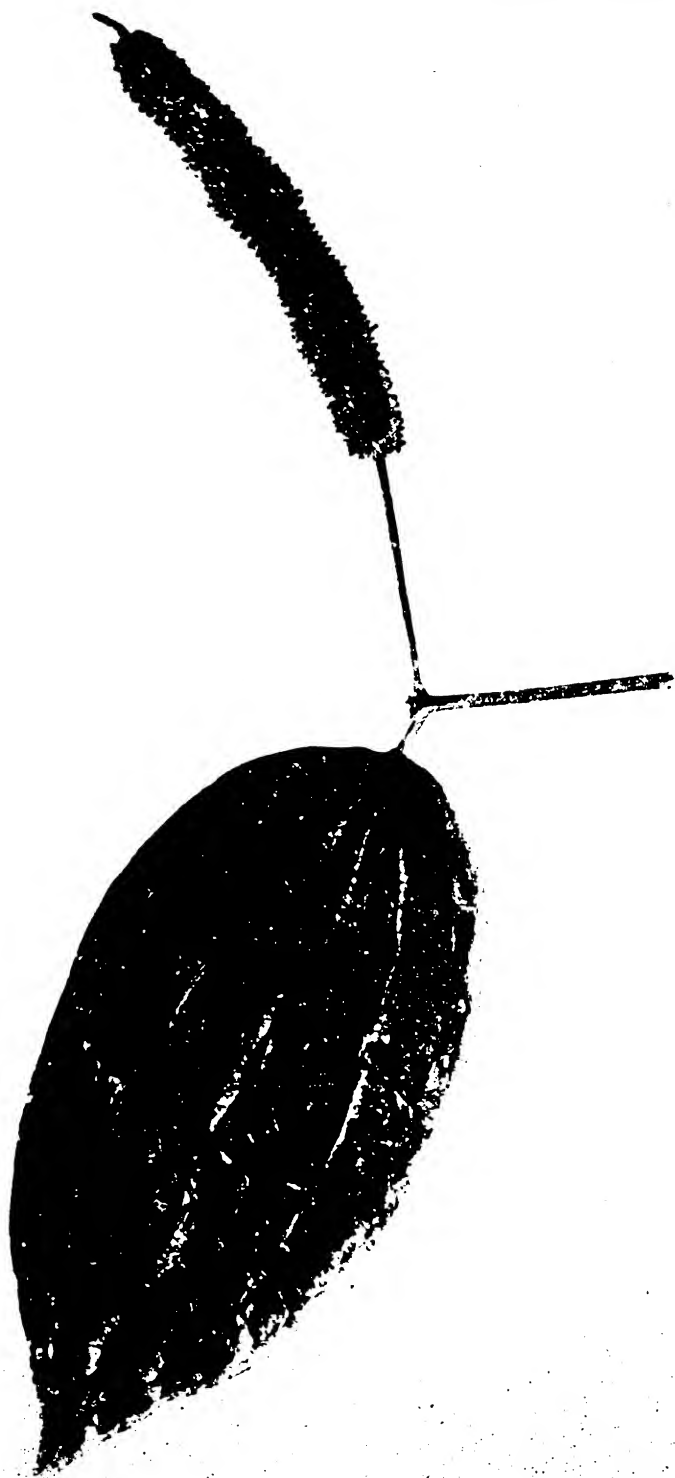
Hab. : Evelyn, *J. F. Bailey*.

Order CONIFERÆ.

PODOCARPUS, L'Her.

P. pedunculata (Male amenta pedunculate), *Bail.* A tall tree with very dark bark. Leaves oblong-linear or linear-lanceolate, resembling those of *P. elata*, R. Br.; only those of the young plants usually much longer; those on the old trees indistinguishable from the Southern tree. Male amenta usually 3, sessile at the end of a peduncle, shorter, and the basal scales or bracts absent or not prominent as in *P. elata*, R. Br. Female peduncles and fruit not obtainable.

Hab. : Herberton district, *J. F. Bailey*. This species somewhat resembles in the male amenta *P. amara*, Blume, a species of Java.

Plate CXXXVI.**PIPER ROTHIANA, *Bail.***

REPORT ON THE TIMBER TREES OF THE HERBERTON DISTRICT, NORTH QUEENSLAND.

By J. F. BAILEY,
Assistant to the Colonial Botanist.

Brisbane, 10th September, 1899.

SIR,—I have the honour to submit herewith an account of the trees furnishing useful woods which were met with during a visit to the Herberton district in June and July last. They are arranged systematically, with a popular description of each.

In accordance with the wish of the Committee of the Herberton Mining, Pastoral, and Agricultural Association, I examined, for the above-mentioned purpose, the Upper Barron River district, a good deal of the country between there and the Russell River, and the scrubs of the Evelyn district. A plentiful supply of large timbers was noticed in all these parts, a few kinds of which are being cut at the mills. In most cases the same kinds were met with in all the parts visited, but those of the Evelyn district seemed of the finest growth.

Owing to the land, which is of a very rich quality, being required for cultivation in a number of localities, many valuable timber trees are being cut down and burnt. It seems a pity to see such a waste; but as the district abounds with good timber it will be many years before the loss will be felt.

With a view of making the identification easier, aboriginal and local names were obtained where possible, although the latter are in many cases confusing, several different trees, for instance, being cut under the name of "Silky Oak," which are all distinct from the Silky Oak of South Queensland (*Grevillea robusta*).

Again, there are two *Cryptocaryas*, both large trees, known by the name of "Walnut," neither of which is *Juglans nigra*, the Black Walnut of commerce, an American tree, although one was published under that name in a pamphlet locally prepared for the Melbourne Exhibition of 1888. I should not have referred to this had I not been asked on several occasions during my visit if this was the correct name, which seemed to them probable, as the wood had been sent to a firm in Melbourne, who I was told mistook it for black walnut, and spoke favourably of it for use in the manufacture of billiard-tables.

For many years we have been trying to obtain specimens in order to make out the systematic name of the timber called "Cardwell Maple." On my way to Brisbane, at the suggestion of the Hon. A. S. Cowley, I obtained permission to visit the Murray and Tully Rivers, near Cardwell, and found the tree which furnished this timber to be a new *Flindersia* (*F. Chataucaiana*, Bail.), and is identical with the Red Beech of the Herberton district. This timber is very highly thought of in the North, being suitable for many purposes, and I would particularly recommend it to the special attention of a Forestry Board, should such be formed, for planting on a large scale. Other trees of the district that might be recommended for this purpose are—*Culophyllum costatum*, *Flindersia Schottiana*, *Cedrela Toona*, *Blepharocarya involucrigera*, *Castanospermum australe*, *Eucalyptus resinifera* and *E. maculata* v. *citriodora*, *Xanthostemon chrysanthos*, *Eugenia gustavioides*, *Gmelina fusciculifera*, *Daphnandra aromatica*, *Cryptocarya Palmerstoni* and *C. Bancrofti*, *Carnarvonia araliæfolia*, *Embothrium Wickhami*, *Cardwellia sublimis*, *Stenocarpus sinuatus*, *Podocarpus pedunculata*, and *Agathis Palmerstoni*; all of which will be found described in the list attached hereto.

Doubtless the trip would have been productive of a greater number of botanical novelties had I devoted time to the smaller growths, but during the whole of the time my principal attention was directed to the timber trees for which the district has for years been noted, but of which very little was systematically known. However, I was fortunate enough to discover a number of new species, descriptions of which will appear among "Contributions to the Queensland Flora" in next month's *Queensland Agricultural Journal*. Not

the least interesting of these is a pepper, which is allied to the Long Pepper of commerce (*Piper longum*). This new species, which is called "Chib-bi" by the aborigines, who eat the fruit, has been named in honour of Dr. W. E. Roth, Protector of Aborigines in North Queensland, and will be illustrated (Plate CXXXVI.) in the above-mentioned number of the *Journal*.

I desire to thank the following gentlemen for rendering me assistance in the performance of my duties:—Mr. J. Newell, the member for the district; Mr. A. C. Haldane, P.M., and Mr. T. Barclay Millar, of Herberton; the members of the Committee of the Herberton M.P. and A. Association; Messrs. Roberts and Thomas, of Carrington; Mr. W. McCraw, of Atherton; Messrs. James Lynch, G. E. Martin, and Morrow, junr., of Martintown; and Mr. W. Mazlin, of Evelyn.

I have, &c.,

J. F. BAILEY,

Assistant to Colonial Botanist.

To the Colonial Botanist, Brisbane.

LIST OF TREES OF THE HERBERTON DISTRICT WHICH FURNISH WOODS OF A USEFUL CHARACTER.

Those at present cut at the mills are marked with an asterisk.

MAGNOLIACEÆ.

1. *Galbulimima baccata*, *Bail.* An evergreen tree of about 80 ft., with a stem diameter of 18 in. to 2 ft.; the young branchlets having a bronzed appearance from numerous bright ferruginous scales. Leaves oblong-lanceolate, 4 to 5 in. long. Fruit globose, crimson, resembling a fleshy *Callitris* (Cypress Pine) fruit in its form and markings. Seeds embedded in the substance of the fruit. The wood is of a light colour, with a brown centre and rather soft.

PITTOSPOREÆ.

2. *Pittosporum melanospermum*, *F. v. M.* Met with in several parts, especially near Lake Barrine, where it was covered with fruit. A medium-sized tree. Leaves oblong or obovate, prominently veined. Fruit red, seeds black. Wood of a light colour, close-grained.

GUTTIFERÆ.

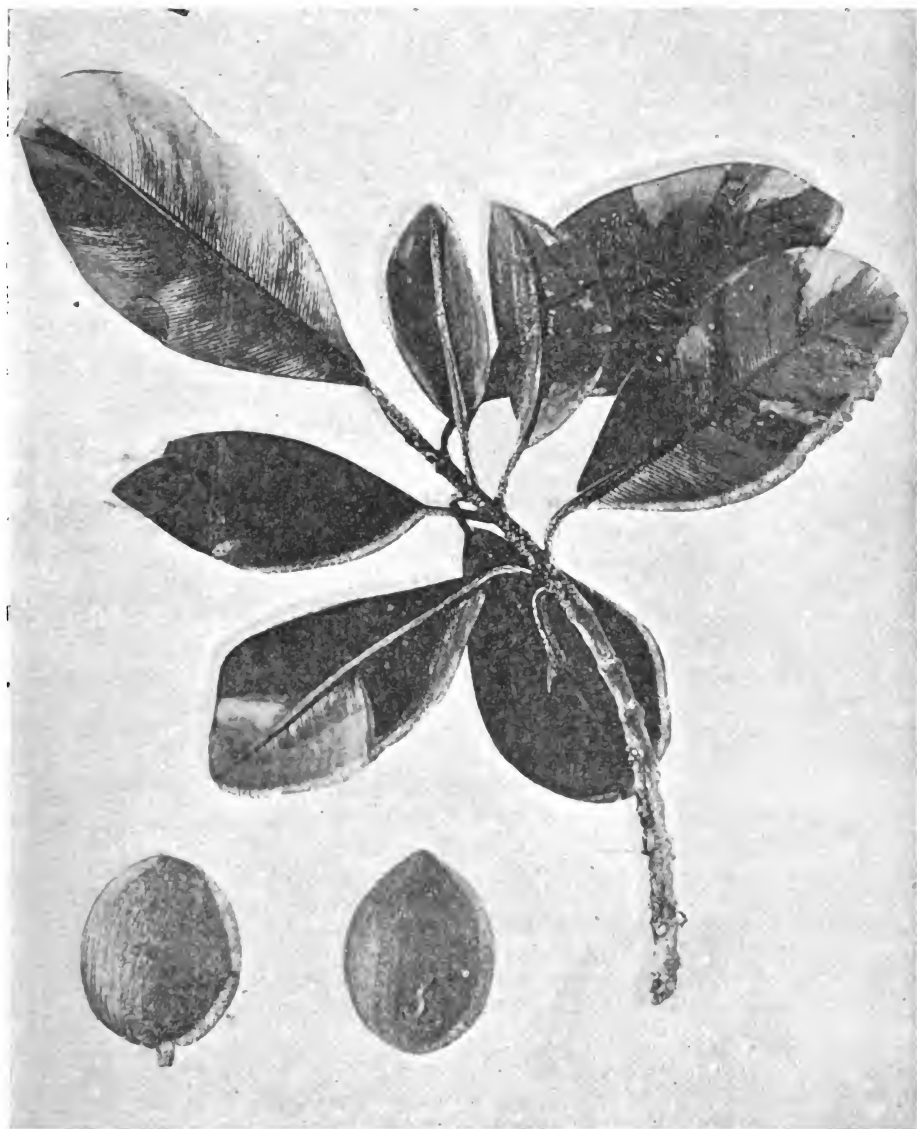
3. *Calophyllum costatum*, *Bail.* (Plate CXXXVII.) Large trees of this were met with at Evelyn. Leaves oblong, tapering towards the base; about 2 in. long and about 1½ in. broad, with thread-like close, parallel veins. Fruit about size and shape of a pigeon's-egg. Mr. Mazlin, who pointed this tree out to me at Evelyn, speaks highly of it, and calls it "Teak." No doubt it would prove useful, like its Queensland allies, *C. inophyllum* and *C. tomentosum*, both of which possess strong durable timbers. The latter yields the poon spars of commerce, and is also used for bridgework in India.

STERCULIACEÆ.

4. *Tarrietia argyrodendron*, *var. peralata*. This is the commonest and one of the tallest trees of the scrubs. It is called "Crow's-foot Elm" by the whites, and "Peirir" by the aborigines. Buttresses at base of stem. Leaves of 3 leaflets; light coloured on underside. Fruit with a wing 2 to 4 in. long, brown coloured. The wood is of a darkish colour, close-grained and firm, easily worked, and should be a useful timber for carpenter (for indoor work), joiner, and cabinet-maker.

5. *Tarrietia argyrodendron*, *var. macrophylla*. A tree with a stem very like the last-mentioned. The leaflets, however, are much larger. The wood is strong, hard, and durable, and the dark-coloured zones add to its beauty and make it worthy of the attention of the cabinet-maker.

Plate CXXXVII.



CALOPHYLLUM COSTATUM, *Bail.*

TILIACEÆ.

6. *Echinocarpus australis*, *Benth.* A fine tall tree, with leaves 6 in. to a foot long, often sharply toothed. Flowers rather large, usually produced at ends of branchlets. Fruit opening into four bristly valves. Maiden's Blush (*Mazlin*). Wood pinkish, close-grained, light, and could be used for lining and flooring boards. In New South Wales this timber is said to be used in cabinet-work, and to be durable and easily wrought.

7. *Echinocarpus*. Mr. Mazlin pointed out to me at Evelyn trees which he called "Scrub Ebony." No flowers or fruits were obtainable; therefore some doubt remains as to genus. The stem-diameter was about 15 in. Leaves broadly ovate-lanceolate, attaining a length of 10 in., and a breadth of 6 in., thin coriaceous, with the lateral nerves and transverse veins prominent on the underside, the margins are sinuately toothed in the upper part; stalks $1\frac{1}{2}$ to nearly 3 in. long, swelled at each end. Mr. Mazlin speaks well of the wood, which he says is of a dark colour (hence the above-mentioned vernacular name) and hard.

8. *Echinocarpus Langii*, *F. v. M.* A tall tree with a stem-diameter of about 18 in. Leaves 3 to 4 in. long, with prominent veins, ovate-lanceolate. Flowers white. Fruit burr-like, about 1 in. in diameter. Wood no doubt likely to prove as useful as others of the genus.

9.* *Elæocarpus grandis*, *F. v. M.* The Quandong is plentiful in all parts. A large tree, the branches almost forming whorls round the stem; leaves long, pointed, and more or less bordered by small teeth. Fruit round, blue outside, stone rough. The aborigines called this tree "Moorgun." Wood makes good weatherboards, and useful for general building purposes. I was informed that it was not affected by white ants.

10. Another *Elæocarpus*, a species near *E. ruminatus*, was seen at Martintown and several other localities. This was a tree 80 ft. high and about 2 ft. in diameter, the wood of which was spoken well of by Mr. G. E. Martin. The aboriginal name is "Coorangooloo."

RUTACEÆ.

11. *Evodia accedens*, *Blume.* Called "Boogoobi" by the aborigines, is met with in all the scrubs. A tallish tree with a smooth bark; the leaves rather large of 3 leaflets. The flowers, which are produced along the branches below the leaves, are pink. The wood is very white, light, and soft.

12. *Zanthoxylon veneficum*, *Bail.* A common species; the stems and branches prickly. The leaves of from 4 to 7, opposite oval-oblong leaflets. Flowers in a terminal panicle. Called in some places "Thorny Yellow-wood." The wood is of a bright yellow colour, close in the grain, and easy to work. According to Dr. T. L. Bancroft, who first discovered the tree on the Johnstone River, the bark contains a poisonous principle as toxic as strychnine, and to whose physiological action it has some resemblance.

13. *Geijera Muelleri*, *Benth.* A tree of medium size, with dense head of deep-green glossy foliage, which gives out a strong fragrance on being rubbed in the hand. The leaves are oval, and the flowers small and white, in straggling bunches. The wood has a beautiful dark coloured heartwood, the rest light coloured, very hard, and would look well if cut into veneers for cabinet-work.

14. *Acronychia Baureri*, *Schott.* A tree attaining a height of 70 ft., with a smooth grey bark. The young growth and inflorescence more or less mealy. Leaves opposite, ovate or obovate, 3 to 5 in. long, of a somewhat firm texture. Short panicles of white flowers in axils of leaves. Fruit nearly globular or 4-angled, $\frac{1}{2}$ in. in diameter. Aboriginal name, "Bunjebah." Common. The wood is hard, and of a uniform yellow colour, or somewhat darker towards the centre.

15. *Acronychia vestita*, *F. v. M.* A medium-sized tree with a smooth light-coloured bark. Leaves 6 in. long and about $3\frac{1}{2}$ in. broad. Fruit whitish, of irregular form; about 1 in. in diameter. Wood of a light colour, soft, nicely marked, easy to work.

16. *Acronychia imperforata*, *F. v. M.* A moderate-sized tree having a stem diameter of 18 in., with leaves of same shape and size as *A. lævis*, as also are the flowers; but the fruit is not angular. Wood of a bright-yellow colour, and hard.

17. *Acronychia lævis*, *Forst.* I only noticed small trees of this, but in some localities it grows into a tall tree. The leaves are oblong, from 2 to 4 in. long. Flowers greenish-white, fruit whitish, often angular. Wood of a light colour and hard.

18. *Acronychia melicopoides*, *F. v. M.* Attains a height of about 50 ft. Bark smooth, light-coloured. Leaves of 3 leaflets, the latter about $\frac{1}{2}$ to 5 in. long, $1\frac{1}{2}$ to 2 in. broad. Fruit yellow, about $\frac{1}{2}$ in. long, of an acid flavour. Wood hard, of a light colour.

19. *Halfordia scleroxyla*, *F. v. M.* The "Ghittoe" of the aborigines, is a tree attaining a height of about 60 ft. and a stem-diameter of about 18 in., with light-coloured bark. Leaves leathery, lanceolate. Fruit $\frac{1}{2}$ in. or more long, red, acid. Common from Evelyn to Russell River. The wood is yellowish when fresh, turning brownish when old; hard, tough, and very inflammable.

MELIACEÆ.

20. *Melia composita*, *Willd.* The White Cedar is very abundant. Sometimes a large tree, but flowering as a shrub, and sheds its leaves in winter. Leaves large, mealy, of numerous leaflets; flowers blue, fragrant. Fruit oval, yellow. The wood is of a light colour, soft and light, with a grain resembling cedar. Mr. W. Pettigrew considers this wood might be useful to the musical instrument maker.

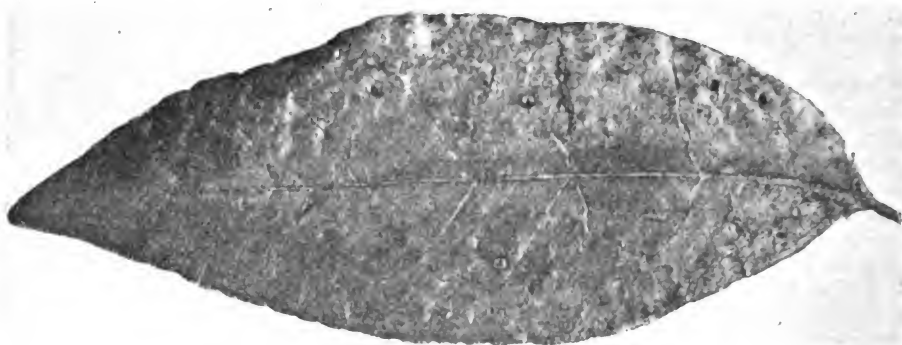
21. *Dysoxylon Pettigrewiana*, *Bail.* A tall deciduous tree with large umbrageous head, stem erect, often with buttresses at base, and reddish bark. Leaves with 5 or 6 pairs of leaflets, and a terminal one which is about 9 in. long and 3 in. broad. Flower spikes erect, about 3 in. long. Fruit pear-shaped, with 4 prominent acute angles, marked with numerous white lenticels, when ripe about $1\frac{1}{2}$ in. long. Wood hard and firm, deep-coloured towards the centre, yellowish near the bark. Useful for cabinet-work and joinery.

22. *Amoora nitidula*, *Benth.* A tall tree with a dense foliage, the leaves of 2 to 4, opposite leaflets, about 4 in. long, rather thick. Panicle of few flowers. Fruit pear-shaped. Aboriginal name, "Jimmie Jimmie." Wood of a light colour and hard.

23. *Synoum glandulosum*, *A. Juss.* A plentiful tree with a scaly bark, attaining a height of 60 ft., and a stem diameter of 18 in.; leaflets 5 to 9, about 2 or 3 in. long. Flowers in short, dense panicles, fruit almost globular, about $\frac{3}{4}$ in. diameter. Wood firm, of a red colour, and easy to work, like cedar, but heavier. In New South Wales, where it is called "Rosewood," it is used for cabinet purposes, turning, carving, and inside of ship and house building.

24. *Hearnia sapindina*, *F. v. M.* "Boodyarra" of the aborigines. A small tree with a smooth bark, and 1, 2, or 3 pairs of leaflets, which are sometimes 11 in. long and 5 in. broad, oblong or oval. Flowers small, yellow. Fruit yellowish, measuring $\frac{1}{2}$ to $\frac{3}{4}$ in. Wood of a grey colour, hard and tough.

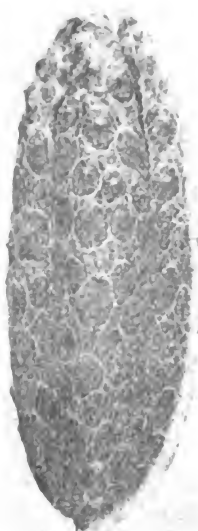
25.* *Cedrela Toona*, *Roxb.* The Red Cedar, called "Wanga" by the aborigines. An immense quantity of this most useful timber is in the district where the trees attain a very large size; the leaflets are from 11 to 17, unequal



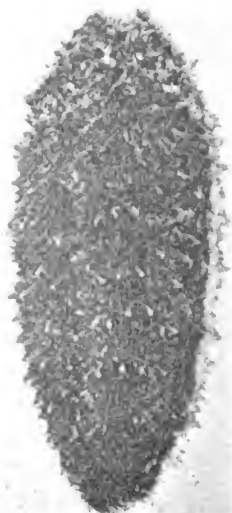
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1. SIPHONODON MEMBRANACEUM, *Bail.*
2. FLINDERSIA CHATAWAIANA, *Bail.* 3. F. MAZLINI, *Bail.*

sided at the base. Flowers white, in drooping panicles. The fluted capsule about 1 in. long, with numerous seeds. The wood, which is too well known to need description, is that most used for housebuilding in these parts.

26.* *Flindersia Chatawaiana*, *Bail.* (Plate CXXXVIII., Fig. 2.) Plentiful throughout the district, where it is known under the name of "Red Beech," and is identical with that cut on the Tully River and other places near Cardwell under the name of "Cardwell Maple." Aboriginal name, "Narroo." The wood, which is of a lightish colour, cedar-like grain, and often prettily figured, is used extensively for building purposes, wagon-building, and in fact may be used for any purpose where a good lasting and bending timber is required. At Cardwell I found that it had proved valuable for boatbuilding, and solid wheels for trollies. It is a large tree with a scaly bark, leaves of about 7, oblong leaflets, 3 to $4\frac{1}{2}$ in. long. Fruit oblong, somewhat 5-angled, 3 in. long, prominently marked with mussel-shaped scars; when ripe splits into 5 boat-shaped pieces.

27. *Flindersia Schottiana*, *F. v. M.* A fine tall tree with a smoothish bark, and is very plentiful. The leaves are composed of from 8 to 12 or more leaflets, which measure 4 to 6 in. long, and more or less covered by soft, short down. Flowers numerous, in large spreading panicle. Fruit large, splitting into separate boat-like pieces. The wood, which somewhat resembles Ash, and goes by that name in the district, is highly spoken of, although at present not cut at the mills. It is of a yellowish colour, close-grained, firm, and would prove suitable for shafts and other parts of carriages, and other purposes where a good bending timber is required. Aboriginal name, "Bunji Bunji."

28. *Flindersia Mazlini*, *Bail.* (Plate CXXXVIII., Fig. 3.) A large tree with a scaly bark, leaves deep-green, of 3 to 5 leaflets, 2 to $4\frac{1}{2}$ in. long. Fruit about the same size as that of the Red Beech, covered with short stout prickles, forming something like a star at the apex. Wood light-coloured and probably valuable.

OLACINEÆ.

29. *Apodytes brachystylis*, *F. v. M.* A tall tree which is common in the Evelyn scrubs. Bark light-coloured, and buttresses reaching some distance up the trunk. Mr. Mazlin, of Evelyn, has a good opinion of the wood, which is of a yellow colour and hard. Leaves lanceolate, 3 to 4 in. long, 1 to $1\frac{1}{2}$ in. broad. Flowers small, numerous, in racemes about 1 in. long. Fruit bluish-green and glossy, about $1\frac{1}{2}$ in. long, $\frac{3}{4}$ in. broad, flat, with a prominent midrib and a juicy swelling on one side.

CELASTRINEÆ.

30. *Siphonodon membranaceum*, *Bail.* (Plate CXXXVIII., Fig. 1.) A small tree called at Evelyn "Wild Orange" on account of the supposed resemblance of the fruit. Leaves 4 to 6 in. long and under 2 in. wide, pointed at the apex, and of much thinner texture than other species of the genus. Fruit 2 in. in diameter, globose, more or less sunk at the apex, and often with 5 deep gutters. The wood is very similar to that of the Ivory-wood (*S. australe*, Benth.)—viz., white, close in the grain, and might probably suit for engraving.

RHAMNEÆ.

31. *Alphitonia excelsa*, *Reiss.* The Red Ash is plentiful, and attains a good size. The bark is very rough. The leaves usually 3 to 6 in. long, white underneath. Fruit small, black, in panicles, the outer skins cracking off and showing a mealy substance of a light or dark yellow colour. Wood somewhat pinkish near the bark, but dark-brown in the centre, very tough, probably a good wood for the cabinet-maker.

SAPINDACEÆ.

32. *Diploglottis Cunninghamii*, var. *diphyllostegia*. Native Tamarind. A large tree with a somewhat brownish smooth bark, the young branches velvety. Leaflets 1 to 9, oblong, more or less hairy, 5 to 8 in. long. Fruit with 2 or 3 lobes, containing round seeds, with an amber-coloured juicy covering, which may be used for jam-making; wood light-coloured, close grained and tough.

33. *Castanospora Alphandi*, *F. v. M.* A tree attaining a height of 60 ft. or more. Leaflets oval-lanceolate, 3 to 6 in. long. Fruit about $\frac{1}{2}$ in. broad, bearing 1 to 3 round chestnut-coloured seeds; wood of a yellowish colour, hard and close in the grain.

34. *Cupania sericolignis*, *Bail.* A small tree with angular branchlets, leaflets from 2 to 7, usually about 5, oblong to ovate-lanceolate, the terminal one the largest, and attaining a length of 6 in. Flowers small, white, in slender racemes. Wood of a greyish colour, soft, easy to work, and suitable for cabinet-work. This was received some years ago from the late Mr. E. Cowley, of Kamerunga, under the name of "Silk-wood," but at the present the Red Beech herein mentioned is known at Cairns under that name.

35. *Ratonia lachnocarpa*, *F. v. M.* A small tree with a smooth bark and a light-coloured hard wood. Leaflets few, ovate, 2 to 4 in. long. Fruit very hairy, nearly 1 in. broad.

36. *Ratonia Nugenti*, *Bail.* "Chambin" of the aboriginals. A small tree, the branchlets dark-coloured and angular. Leaves of from 4 to 6 leaflets, which are ovate-lanceolate, 5 to 9 in. long. Flowers small. Fruit about 1 in. broad, yellow, somewhat succulent.

37. *Nephelium Callarrie*, *Bail.* A graceful erect tree, attaining a height of 50 ft. Leaflets 5 to 13, oblong-lanceolate, 5 to 9 in. long, under 2 in. broad, pale-coloured. Flowers small, in large panicles. Fruit at present unknown. Met with frequently. Called by the aboriginals "Callarrie."

ANACARDIACEÆ.

38.* *Blepharocarya involucrigera*, *F. v. M.* (Plate CXXXIX.) "Chargir" of the aboriginals. A fine tall tree, with a smooth, grey bark, which is very plentiful throughout the district. Leaves of about 7 pairs of leaflets; flowers minute; fruit a much-divided cup. The wood is of a light-red colour, nicely figured, close-grained, soft, and easy to work. Mr. G. Martin, of Martintown Sawmills, sometimes cuts this and calls it "Bally Gum."

39. *Euroschinus falcatus*, *Hook.* A large tree, which I found in all the scrubs. The foliage when rubbed in the hand smells something like celery. Leaves of 4 to 8 leaflets, curved and tapering to the point, 2 to 4 in. long. Flowers small. Aboriginal name, "Kokare." Wood of a pinkish colour, or quite white, soft, light, tough, and might serve for making oars.

40. *Pleiogynium Solandri*, *Engler.* Known in some parts of the colony as the "Burdekin Plum," is a largish tree with a spreading head. Leaflets of from 2 to 5 pairs, with a terminal odd one. Fruit somewhat globose, with a flattish top; 1 to 1½ in. diameter, rich purple when ripe; the outside fleshy part eaten by natives. Wood hard, dark-brown with red markings, resembling American walnut. Excellent for cabinet-maker and joiner; also suitable for turnery.

LEGUMINOSÆ.

41.* *Castanospermum australe*, *A. Cunn.* The Bear-tree is common, and grows to a large size. It has a smoothish bark and large deep-green leaves of from 11 to 15 pointed leaflets. Flowers large, at first yellow but changing to scarlet. Pods large, containing beans resembling chestnuts. Aboriginal name,

Plate CXXXIX.



BLEPHAROCARYA INVOLUCRIGERA, *F. v. M.*

"Wac-kay." The wood is used in the district for mine shafts, and also extensively for fencing-posts, as it stands well in the ground. The dark-coloured hardwood is prized by cabinet-makers and turners, but shrinks a good deal in drying.

42. *Acacia auriculiformis*, *A. Cunn.* An erect tree of about 40 or 50 ft., with a straight trunk; met with on the borders of scrubs. Leaves oblong, curved, 5 to 8 in. long, 1 to 2 in. broad. Pods broad, hard, almost woody, greyish, much twisted, with wavy margins.

ROSACEÆ.

43. *Pygeum Turnerianum*, *Bail.* A moderate-sized tree with small buttresses at base of trunk. Leaves, upperside bright glossy green, underside pale, lanceolate, 4 to 6½ in. long, nerves prominent on underside. Fruit heart-shaped, of a rich plum colour, transversely slightly exceeding 1 in. in diameter. Nut nearly the size of the fruit, prominently veined. A most interesting species on account of being the only near relation in Australia of the domestic plum. The wood is of a red colour in the centre, nicely marked, easy to work, useful for turnery and cabinet-work.

SAXIFRAGÆÆ.

44. *Davidsonia pruriens*, *F. v. M.* The Davidsonian Plum is a small tree. Leaflets irregular as to size, toothed. Flowers in a long drooping panicle. Fruit oval, attaining the size of a goose-egg, at first covered with stiff brown hairs; juice purple when ripe, of a sharp acid. Fruit used for jam-making. Wood of a dark-brown colour, hard, tough, and durable; useful for tool-handles and mallets.

45. *Weinmannia lachnocarpa*, *F. v. M.* A large tree with a rough scaly bark. Leaves of three leaflets 2 to 6 in. long. Flowers small, succeeded by capsules which are clothed with a dense brown wool. In South Queensland this tree is called "Scrub Redwood." Wood pink, hard, tough, and heavy; it might be used for making planes, mallets, and chisel-handles.

MYRTACEÆ.

46. *Callistemon lanceolatus*, *DC.* The Red Bottle Brush or Water Gum grows in the gullies about Herberton. I only saw small trees, but in some localities this grows to a fair size. It has a rough brown bark, and narrow feather-veined leaves 1 to 3 in. long, and usually silky. The flowers are in nodding spikes, and are of a pink or deep-red colour. The wood is of a red colour, hard, and tough; and in South Queensland is used for shipbuilding and wheelwrights' work.

47. *Eucalyptus eugenoides*, *Sieb.* The Stringybark is common on forest country. A tree of moderate size, with a fibrous bark. The leaves of young shoots rough. The wood, which is of a pinkish colour, may be used for house-building, fencing-rails, &c., as it is hard and tough.

48. *Eucalyptus pilularis*, *Sm.* A form of this species, which is known under the name of "Blackbutt," is common about Herberton. It is a large tree with persistent bark at the base, but falling off from the upper part of the trunk and branches. The wood of the normal form is of a light-grey colour, hard, tough, and durable; used for housebuilding, fencing, and other work where strength and durability are required.

49.* *Eucalyptus siderophloia*, *Benth.* Ironbark. A large tree with a deeply furrowed thick bark. Wood close-grained, hard, heavy, and durable; useful for beams in buildings, railway sleepers, &c.

50.* *Eucalyptus tereticornis*, *Sm.* The Blue Gum of Queensland—one of the commonest of forest trees, the largest and best being met with on the Evelyn tablelands. The wood is of a red colour, close-grained, and durable, and is useful for building, wood-paving, and other purposes.

51. *Eucalyptus platyphylla*, *F. v. M.* The Broad-leaved Poplar Gum was met with in several localities, but only on poor land. It is usually a tree of moderate size, but sometimes large. The leaves, which somewhat resemble large poplar leaves, are sometimes as much as 10 in. in diameter. The wood is deep-red, hard, but subject to gum veins. In some localities it is considered very durable as fencing material; but this opinion does not prevail in this district.

52.* *Eucalyptus saligna*, *Sm.* It is plentiful on the margins of scrubs, and is called by some "Scrub Blue Gum." Some fine specimens are to be seen at Evelyn, which are about 11 ft. or more in diameter. The wood is tough and close-grained, and is well spoken of.

53.* *Eucalyptus resinifera*, *Sm.* The Red Stringybark or Forest Mahogany. There is a good supply of this valuable timber. It is a large tree with a red fibrous bark. The wood is of a rich red colour, strong, and durable, and is used for piles, fencing-posts, and the large beams in buildings. In New South Wales it has been known to keep sound in the ground for 50 years.

54.* *Eucalyptus corymbosa*, *Sm.* The Bloodwood is very common. The timber is not considered good below the range; but at Evelyn, where the finest trees are to be met with, Mr. Mazlin speaks very highly of it.

55.* *Eucalyptus maculata*, *Hook., var. citriodora.* The Citron-scented Gum is very abundant. It forms a handsome tree, the bark falling off in patches, leaving an indentation where each piece was attached, thus giving a spotted appearance to the trunk. Leaves with a citron-like fragrance. Wood of a light colour, very elastic and durable, and most valuable for wheelwright and carriage work.

56.* *Eucalyptus tessellaris*, *F. v. M.* The Moreton Bay Ash is fairly plentiful. It forms a graceful often large tree, with the bark persistent and cracked into squares on the lower part of the trunk, but falling off on the upper part and branches. The wood is of a dark-brown colour, except near the bark, close-grained, tough, and durable.

57. *Syncarpia laurifolia*, *Ten.* The Turpentine, is plentiful. A tall erect tree with a fissured, fibrous, persistent bark. Leaves clustered at ends of branchlets, hoary. Fruits joined together, forming heads. The wood is of a light colour near the bark, but the rest dark-brown. Useful for piles and girders.

58. *Xanthostemon chrysanthos*, *F. v. M.* The "Choolo-Choolo" of the aborigines. A tall handsome tree, with a light-coloured bark. Leaves, lanceolate, 4 to 6 in. long on short stalks; flowers numerous, large, of a bright golden-yellow; known in the district as "Johnstone River Hardwood"; the wood is extremely hard and heavy, and should prove serviceable for railway sleepers, bridge-work, &c.

59. *Rhodamnia sessiliflora*, *Benth.* The "Koorkabidgan" of the aborigines is a medium-sized tree, with a somewhat fibrous bark, and the branchlets somewhat hoary; leaves narrow-ovate, thin, 3 to 5 in. long, with 3 prominent nerves; flowers stalkless, often 3 together in the axils; fruit small, globular; wood of a dark colour, hard and tough.

60. *Myrtus Hilli*, *Benth.* "Kalaara" and "Mangoor" of the aborigines, but which is known throughout the colony as the "Scrub Ironwood," is common. It is a medium-sized tree, with a very thin, smooth, green (often reddish) bark. Leaves glossy, ovate, pointed, 1 to 2 in. long. Flowers and fruit small, the latter globular, containing several seeds. Wood of a light-grey colour, close-grained, and very hard, but warps in drying.



EUGENIA GUSTAVIOIDES, *Bail.*

61. *Eugenia gustavioides*, *Bail.* (Plate CXL.) A fine large tree with a smoothish bark. Leaves oblong-lanceolate, 5 in. long and $2\frac{1}{2}$ in. broad. Fruit globular, attaining 2 in. in diameter; rind of a dark colour, hard and dry, crowned by a wide circular scar. Like many of the large kinds of the genus, should furnish a valuable timber.

62. *Eugenia cormiflora*, *F. v. M.* The "White Apple" of the whites, and "Moorool" of the aboriginals, is a tree of moderate size, which bears its large white fruit on knotty belts all up the trunk. The wood is of a dark colour, close-grained, and tough.

63. *Eugenia leptantha*, *Wight.* A tree with pale foliage. Leaves oval to oblong on short stalks. Flowers in short bunches on the previous year's wood at the knots formed by old leaves. The wood is of a grey colour, close in the grain and hard.

64. *Eugenia hemilampra*, *var.* Known as "Scrub Mahogany," is a tree of large size and plentiful. Leaves lanceolate, 3 to 5 in. long, upperside dark-green, underside more or less light coloured. Flowers small and numerous. Fruit large, globular, crowned by a small circular scar. Wood of a darkish colour, hard, and, according to Mr. Mazlin, very durable.

65. *Eugenia angophoroides*, *F. v. M.* A fine large tree, called "Woorboon" by the aboriginals; bark light-coloured and smooth. Leaves oblong-lanceolate, 2 to 3 in. long. Flowers in panicles at ends of branchlets. Fruit small, depressed, globular.

66. *Eugenia grandis*, *Wight.* Called by the aboriginals "Waargoon-Waargoon." A fine large tree which is rather common, with a reddish papery bark, which peels off in thin skin-like flakes; hence its name in some parts of the district of "Scrub Tea-tree." The leaves are thick, oval-oblong, 4 to 6 in. long, and shiny. Flowers large at or near the ends of the branchlets. Fruits large, globular, white. The wood is of a light-brown colour, hard, and tough, and has been recommended for making staves for rum-casks. It would also be suitable for building purposes.

ARALIACEÆ.

67. *Panax Murrayi*, *F. v. M.* A very handsome tree; the leaves on young trees 5 to 6 in. long, with the leaflets 8 to 12 in. long. Aboriginal name, "Koorgarrie." Wood of a light colour, soft, and light; would make good lining-boards.

68. *Panax elegans*, *F. v. M.* A tall graceful tree, the foliage generally at the ends of the branches. Wood soft, light, and elastic; excellent for lining-boards, and would probably prove a most useful wood to musical instrument makers.

CORNACEÆ.

69. *Marlea vitiensis*, *Benth., var. tomentosa.* A common tree of moderate size, called by the aboriginals "Cartalogoer." The leaves ovate-oblong, more or less velvety, often having a small dimple in the axils of the principal veins. The wood is of a yellow colour towards the bark, the centre black, and has a musk-like scent. An excellent wood for cabinet-work. The normal form, which is rare in Queensland, was also met with at Evelyn; the leaves of this are wanting in the velvety covering of the variety.

RUBIACEÆ.

70. *Timonius Rumphii*, *DC.* A tree of moderate size, the bark somewhat fibrous. Leaves narrow-ovate, the young shoots often silky. Flowers small, fruit globular, $\frac{1}{4}$ in. in diameter. The wood, which somewhat resembles English sycamore, is light in colour and easily worked, and would be useful for lining-boards.

MYRSINÆÆ.

71. *Myrsine variabilis*, *R. Br.* Small trees met with, but in some localities it grows into a fair-sized tree. Foliage very variable. Flowers small and numerous along the branches. Wood close-grained, light-coloured, and firm.

SAPOTACEÆ.

72. *Sideroxylon*, near *S. chartaceum*. A plentiful tree, called by the aborigines (who are very fond of the fruit) "Moiary" and "Chandally." A tall tree with a light-coloured bark. Leaves obovate-oblong, thin. Fruit about 1 in. in diameter containing 5 brown, glossy seeds. Wood light-coloured and hard.

73. *Sideroxylon laurifolium*, *F. v. M.* A tall tree with a sweet bark. Leaves oval-oblong, 3 or more inches long. Wood light-grey towards the outside, brown in the centre.

EBENACEÆ.

74. *Maba sericocarpa*, *F. v. M.* A small tree. Leaves oblong, hairy, 3 to 4 in. long. Fruit in a cupshaped calyx, globular, silky-hairy. Wood light-coloured, hard and tough.

OLEACEÆ.

75. *Olea paniculata*, *R. Br.* A tall tree with a somewhat speckled bark. Leaves pale-green, pointed-oval, 2 to 5 in. long. Flowers small, white, the bunches in the axils of the leaves and at the ends of the branches. Fruit oval, resembling the common olive. Mr. Mazlin, of Evelyn, who calls this the "Pigeonberry Ash," speaks well of the wood, which is of a whitish colour, darkening towards the centre, hard, and prettily figured.

APOCYNACEÆ.

76. * *Alstonia scholaris*, *R. Br.* A large tree, exuding a milky juice, is abundant, and known as "White Pine." The bark is grey, and the branches, like the leaves, whorled. Leaves, 5 to 7 in each whorl, whitish on the underside. Flowers small, white. Fruit 2 long horn-like narrow pods, containing hairy seeds. Aboriginal name, "Koorool" and "Chalgun." The wood is of a light colour, soft, and close-grained, and is useful for indoor work in housebuilding. This tree enjoys a wide range. In India, where it is also common, the bark is used as a remedy in chronic diarrhœa and dysentery; it also furnishes the "ditain" of commerce, a valuable remedy in cases of fever.

77. *Alstonia villosa*, *F. v. M.* A tree about 10 ft. high, the branchlets and underside of the leaves velvety. Leaves in whorls of 3, oval-oblong, 4 to 6 in. long. Fruit double, horn-like, narrow, 6 to 12 in. long, containing hairy seeds. Wood of a light colour, works easily, firm, and would probably do for staves.

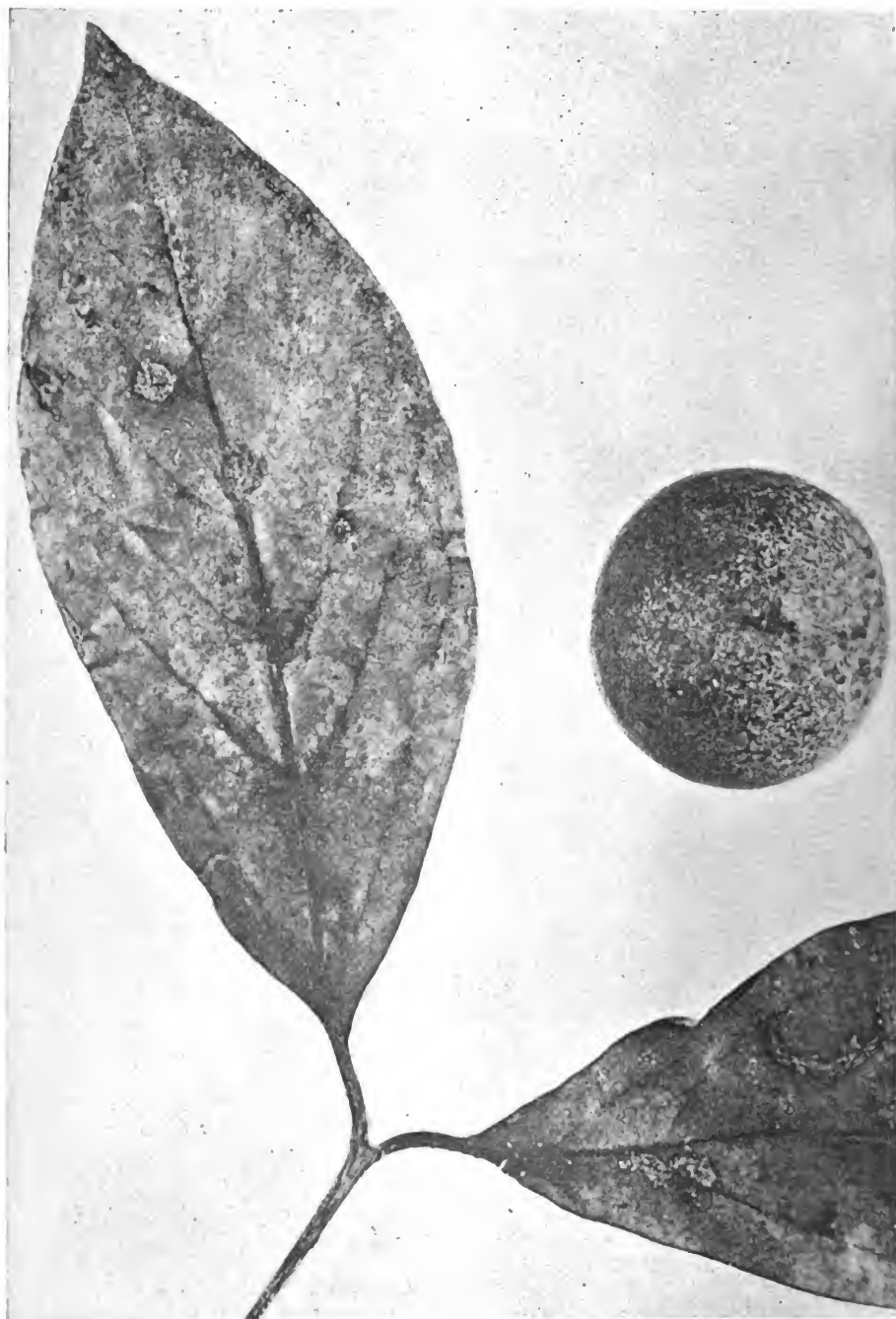
SOLANACEÆ.

78. *Duboisia myoporoides*, *R. Br.* Noticed on the edge of scrubs in several localities, is a small tree with a white corky bark. The leaves are narrow-oblong, of a grey colour, 2 to 4 in. long. The flowers are in large spreading panicles. Fruit small, black, and juicy when ripe. Wood of a light-yellow colour, light, and firm. Said to be excellent for carving and wood engraving. An extract from the leaves of this plant called "duboisine," was discovered by the late Dr. J. Bancroft, and used by him and others in ophthalmic surgery.

BIGNONIACEÆ.

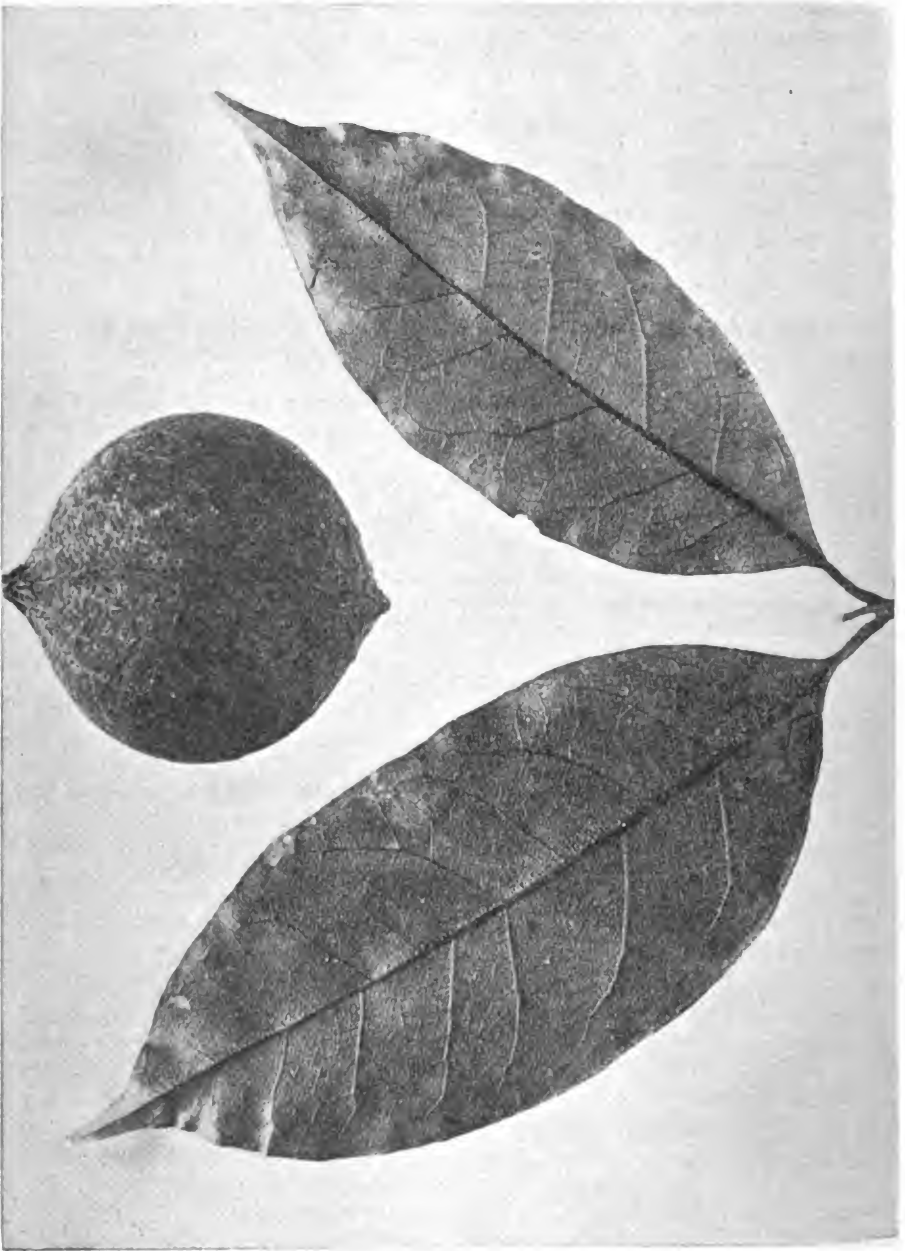
79. *Diplanthera tetraphylla*, *R. Br.* A beautiful tree, with a thick, soft, somewhat corky bark. Leaves usually in fours round the stem, often 2 ft. long and 1 ft. wide, rough. The flowers are yellow, and somewhat resemble the foxglove, and are produced on a large panicle at the ends of the branches. The wood is of a whitish colour, close-grained, and firm.

Plate CXL.



CRYPTOCARYA PALMERSTONI, *Bail.*

Plate CXLII.



CRYPTOCARYA BANCROFTI, *Bail.*

VERBENACEÆ.

80.* *Gmelina fasciculiflora*, *Benth.* The White Beech of the district, is rather scarce about the Barron Valley, but more plentiful in the Evelyn district. A tall tree. Leaves ovate, 3 to 5 in. long, glossy above, veins raised on the underside. Flowers in the panicle, in clusters. Aboriginal name, "Toeah." The wood greatly resembles that of the Southern Beech (*G. Leichhardtii*), and is used for the same purposes—viz., for flooring of verandas and any work that is exposed to the weather.

MYRISTICÆ.

81. *Myristica insipida*, *R. Br.* The Native Nutmeg is a moderate-sized tree, the young shoots often rusty. Leaves oval, the underside of a light colour, 4 to 6 in. long, the veins prominent. Fruit oval, about 1 in. long. Aboriginal name, "Kurroonbah." Wood of a pinkish colour, tough, and easily worked.

MONIMIACEÆ.

82.* *Daphnandra aromatica*, *Bail.* A large tree, of which there is a plentiful supply, known locally as "Sassafras," and by the aborigines as "Cheedingnan." The bark smells like Sassafras, and the leaves, which are stiff and fragrant, are 3 to 4 in. long. The fruiting perianth-tube is black, about 1 in. long. (This must not be confused with the "Sassafras" of commerce, which belongs to another natural order, and is not indigenous in Australia.) The wood, which is sometimes cut at the mills, is of a light colour, not unlike pine-wood, for which it would form a substitute.

83. *Daphnandra repandula*, *F. v. M.*, is also common. It is a tree of moderate size, with rather thin leaves, the margins of which are wavy, 4 to 6 in. long. The flowers are fringed and in straggling bunches. Fruit about 1 in. long, seeds hairy. The wood is of a light colour, nicely figured, and would probably do for engraving purposes.

LAURINEÆ.

84. *Cryptocarya Palmerstoni*, *Bail.* (Plate CXLI.) There is a good supply of this magnificent tree, which is locally known as "Black Walnut," on account of the wood resembling that of the black walnut of commerce. Tree attains a large size, girth at base often 30 ft., tapering proportionally upwards for 80 or 90 ft. before branching. Leaves oblong, 4 to 5 in. long. Upper surface glossy and glabrous, underside clothed with a light-coloured tomentum. Fruit nearly globular, about 2½ in. in diameter, enclosing a round nut more than 1 in. in diameter. The kernels, after being roasted and steeped in water for about 12 hours, form one of the principal foods of the aborigines when the fruit is in season. Aboriginal name, "Koi-ie."

85. *Cryptocarya Mackinnoniana*, *F. v. M.* Called by the aborigines "Koojoongaroo," is a large tree common in all parts. Leaves oblong, 4 to 8 in. long, prominently pinniveined and reticulate underneath. Flowers numerous on loose panicle. Fruit oval, black, ¾ in. long. Wood of a grey colour, close-grained, and hard.

86. *Cryptocarya Bancroftii*, *Bail.* (Plate CXLII.) Another large tree, is plentiful about Evelyn and other parts. Mr. Mazlin, of Evelyn, calls it the "Red Walnut." Leaves lanceolate, 4 to 5 in. long and 1 to 1½ in. broad in the centre. Fruit about 2 in. long with a diameter of 1½ in., rough, the outer covering forming but a thin bark to the shell of the nut, which is of a reddish-brown colour and pointed at the apex. Kernel, after preparation, is eaten by natives.

87. *Cryptocarya insignis*, *Bail.* The "Boomban" of the aborigines, is a tree of medium size and very plentiful. The branchlets are bluntly angular. Leaves ovate, upper surface smooth, underside covered with rusty hairs. Fruit, when

ripe, a rich pink, somewhat pear-shaped, about $2\frac{1}{2}$ in. long and $2\frac{1}{4}$ in. broad, enclosing a nut $1\frac{1}{2}$ in. diameter, the kernel of which, after similar preparation to that of the *Koi-ie*, forms a food for the natives.

88. *Endiandra glauca*, *R. Br.* A small tree with a thin, hard, smooth bark, the young shoots and inflorescence clothed with a rusty coating of hairs. Leaves oblong, pointed, 3 to 5 in. long, white on the underside. Fruit $\frac{1}{2}$ in. long, black. Wood light-coloured, close-grained, hard, and tough.

89. *Endiandra hypotephra*, *F. v. M.* A moderate-sized tree with a smooth grey-coloured bark. Leaves ovate, 3 to 5 in. long. Fruit black, oblong, $\frac{3}{4}$ in. long. Wood yellowish, wavy, and prettily marked.

90. *Litsea dealbata*, *Nees.* A moderate-sized tree which is very common, and called by the aborigines "Marragiddie." Leaves oval, 3 to 6 in. long, white on the underside. Flowers in close bunches along the branchlets. Fruit small, globose, purple. Wood of a yellowish colour, with numerous short brown longitudinal streaks, tough, and close-grained.

91. *Litsea ferruginea*, *Benth.* A tree of moderate size, clothed with rusty short hairs. Leaves 3 to 6 in. long, rusty on the underside, where the veins are raised. Fruit oval. Wood pale-yellow, light, close-grained, and prettily marked.

PROTEACEÆ.

92. *Grevillea gibbosa*, *R. Br.* A small tree common about Herberton; the foliage clothed with white, silky, short hairs. Leaves narrow, 4 to 5 in. long. Flowers small, in a dense spike-like raceme. Fruit nearly globular, woody, 1 to $1\frac{1}{2}$ in. diameter, containing 1 or 2 thin winged seeds. Wood dark-brown, prettily marked, hard, of a greasy nature.

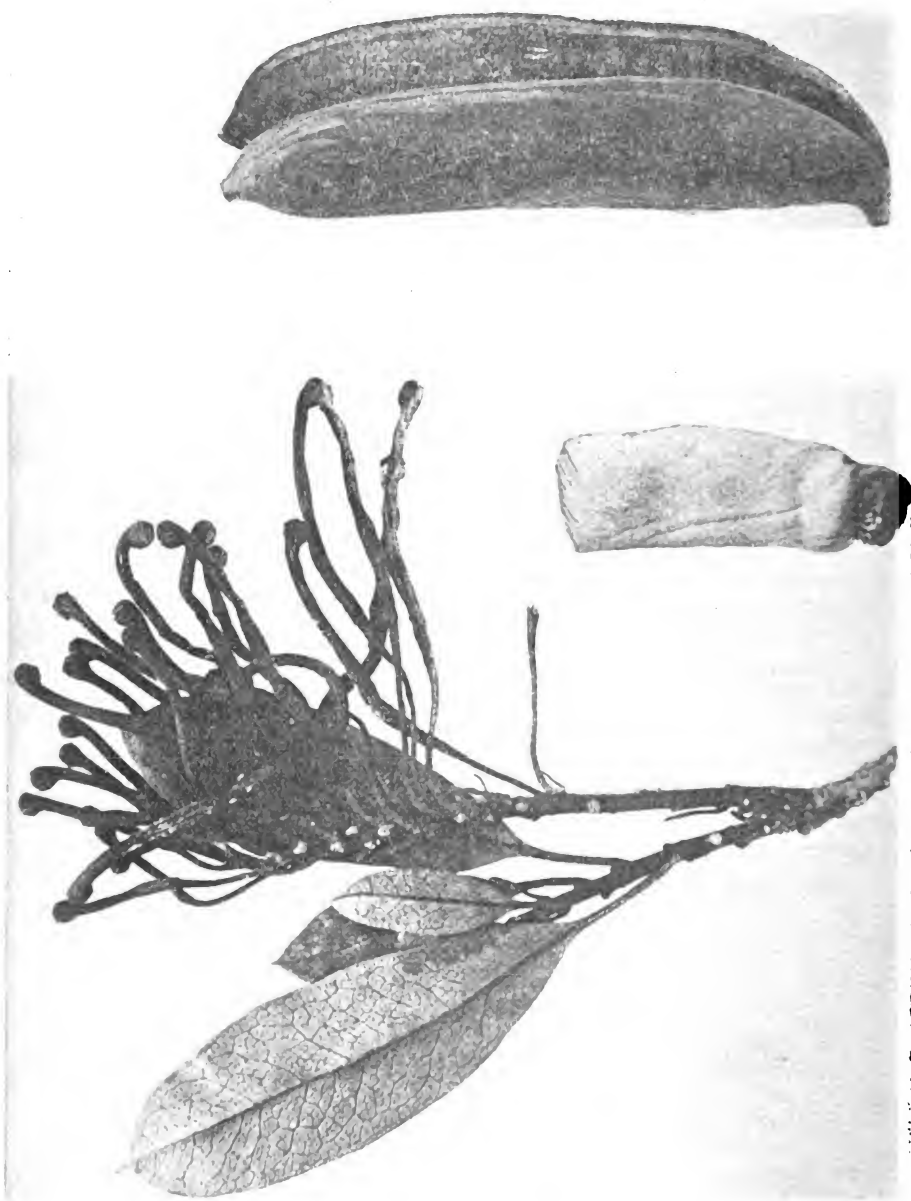
93. *Carnarvonia araliæfolia*, *F. v. M.* Called "Red Oak," is common. It is a good-sized tree, with leaves of from 3 to 5 leaflets on the end of a rather long stalk. Capsule incurved, pointed, $1\frac{1}{2}$ in. long, thin. Seeds winged. Aboriginal name, "Niah." Wood of a red colour, firm, and fine-grained, useful for coopers and cabinet-makers.

94. *Darlingia spectatissima*, *F. v. M.* A large tree with a smooth bark. Leaves large, oblong, entire or deeply lobed. Flowers in panicles at the ends of the branchlets, fragrant. Fruit compressed, $1\frac{1}{2}$ to 2 in. long. Seeds flat and thin, surrounded by a wing-like margin. This is one of the trees called "Silky Oak," the wood of which is tough and nicely marked, and should prove a useful timber, especially for the cooper and cabinet-maker. Aboriginal name, "Chalagar."

95. Under the designation of "Brown Silky Oak" is a large tree growing in the Evelyn district, but no flowers or fruit were obtainable, which the Colonial Botanist considers, judging from leaves alone, may probably be an undescribed species of *Darlingia*, and for the present it had better be given as *Darlingia ferruginea*. The leaves are narrow-lanceolate, exceeding 1 ft. in length, with a breadth of $2\frac{1}{2}$ in., the parallel lateral-nerves, which on the underside are very prominent, loop and form an intra-marginal nerve at some distance from the edge of the leaf; upper-surface smooth. Under-surface rusty pubescent, more dense on the midrib and nerves. When the flowers and fruit are available, this may prove only a more densely ferruginous form of *Darlingia spectatissima*. Wood darkish-coloured, prettily marked, and tough.

96. *Hollandæa Lamingtoniana*, *Bail.* A handsome tree of medium size, met with in the Evelyn district; the branchlets, leaf-nerves, leaf-stalks, and inflorescence densely clothed with rusty hairs. Leaves roundish-ovate, 4 to 6 in. long, nerves on underside very prominent. Flowers numerous, deep-coloured. Only medium-sized trees were seen, but probably they attain a considerable size, as plants of this order frequently flower at an early stage of their growth. Wood tough, prettily marked like many others of the order.

Plate CXLIII.



EMBOTHRIUM WICKHAMI, *F. v. M.*

97. *Cardwellia sublimis*, *F. v. M.* Called "Silky Oak," is common in all parts. A large tree; the young growth rusty hoary. Leaves of 4 to 10 oblong leaflets, 3 to 8 in. long. Fruit 3 or more inches long, broadly-oblong, containing many winged seeds. Wood of a light colour, prettily marked, stands well in drying, and would be suitable for cabinet-work, picture-frames, wine-casks, &c.

98. *Stenocarpus sinuatus*, *Endl.* By some called "White Silky Oak," is also a plentiful tree. It is tall and handsome, with glossy foliage, the leaves on young plants often over 1 long and of several more or less spreading lobes, but usually on adult trees entire and not over 6 in. long. Flowers in spreading umbels, orange-red. Fruit about 4 in. long, narrowing towards each end, and containing numerous winged seeds. Wood light-coloured, tough and firm, nicely marked, and would do well for cabinet-work.

99. *Embothrium Wickhami*, *F. v. M.* (Plate CXLIII.) Called the "Red Silky Oak." A common tree which grows to a large size. Leaves oval or oblong, narrowing at the base to a rather long stalk. Flowers large, orange-red, in dense bunches. Fruit cylindrical, 3 or 4 in. long. Seeds winged. The wood is of a pinkish colour, soft, tough, and beautifully marked, and would be very serviceable and showy for cabinet-work. To show the grain to advantage, it should be split or sawn on the quarter. On account of its free-splitting and lasting qualities, it is used extensively for close-paling farms in the district.

EUPHORBIACEÆ.

100. *Phyllanthus Ferdinandi*, *Muell. Arg.* The variety *mollis* of this moderate-sized tree was occasionally met with along the creeks. It differs from the normal form in the leaves, branches, and flowers being velvety. Leaves oval-oblong, usually 3 to 4 in. long, but sometimes longer. Flowers small, often situated at a short distance above the axils of the leaves. Fruit depressed-globular. Wood of a grey colour, close-grained, easy to work, but is found to warp much in drying.

101. *Aleurites moluccana*, *Willd.* The Candle-nut is plentiful everywhere. A tall tree with a wide-spreading head, the foliage and young shoots covered with a mealy substance. Leaves on young plants large, attaining 18 in. in diameter, 3 or more lobed, but much smaller and entire on large trees. Fruit 2 or more inches in diameter, nut nearly globular, several in each fruit. The wood is whitish, soft, and light, and, I am afraid, of not much value; but the nuts contain an oil which is known in commerce as Candle-nut—or Country Walnut—oil. Aboriginal name, "Nappalla."

102. *Croton insularis*, *Baill.* The Queensland Cascarilla Bark is met with throughout. At the edge of scrubs it forms a small round-headed tree, but inside a tall erect tree with scanty foliage. The bark is rough and fragrant. The leaves ovate with the young shoots silvery. Flower racemes 3 to 5 in. long. Fruit 3-lobed, about $\frac{1}{4}$ in. in diameter. The wood is of a yellow colour, hard, and very tough.

103. *Baloghia lucida*, *Endl.* The Scrub Bloodwood is a large tree, with the stem often knotted. The rough bark exudes a quantity of red sap with the least wound. Leaves deep-green often glossy, oblong, 3 to 5 in. long. Flowers white, very fragrant; fruit with blunt prickles, over $\frac{1}{2}$ in. in diameter. The wood is of a light-yellow colour, hard, tough, and nicely figured. Besides being a good cabinet-wood, it should prove useful for engraving.

104. *Mallotus philippinensis*, *Muell. Arg.* The Kamela-tree is common. A small tree with leaves on long stalks, oval, pale on the underside, 3 to 5 in. long. Fruit covered with a red mealy substance, which in India, where the tree is also indigenous, is used for dying silk and also as a purgative and anthelmintic. The bark may also be used for tanning. The wood, which is of a light-straw colour, is hard and very tough.

105. *Mallotus polyadenus*, *F. v. M.* A small tree, with oblong leaves which, with the fruit, are covered on the underside with minute golden-coloured glands. The wood is of a light-yellow colour outside, changing towards the centre to a brown, hard, close in the grain, and should prove suitable for mallets, chisel-handles, &c.

URTICACEÆ.

106. *Aphananthe philippinensis*, *Planch.* A moderate-sized tree, with a dense foliage. Stem, diameter about 15 in. Leaves 1 to 3 in. long, rough, and bordered by sharp distant teeth, ovate or, when long, narrow. Fruit ovoid, about $\frac{1}{4}$ in. long. The wood is light-coloured, close-grained, wavy, and might do for stamps.

CASUARINEÆ.

107. *Casuarina equisetifolia*, *Forst.* One of the She Oaks, is common in the forest country. It is a tree of moderate size, with drooping branches of a greyish colour; bark rough. Cones nearly globular, about $\frac{1}{4}$ in. in diameter. The wood is of a dark colour, coarse-grained, and nicely marked.

108. *Casuarina torulosa*, *Ait.* The Forest Oak is also common. It is a tree of moderate size, with a corky bark and drooping slender branches. Cones globular or oblong, over 1 in. long, velvety. Wood of a reddish colour, very prettily marked, close in the grain, and hard. Useful for bullock-yokes.

CONIFERÆ.

109. *Callitris robusta*, *R. Br.* The Cypress Pine, common on sandy ridges, is a tree of a greyish colour, with globular cones. The wood is fragrant, and varies in colour from light to a dark-brown, often with pinkish longitudinal streaks and beautiful markings. An excellent building and cabinet wood. It is said to resist the attacks of white ants.

110.* *Agathis Palmerstoni*, *F. v. M.* The Kauri Pine is in some parts very abundant, and forms one of the largest and noblest trees of the scrubs. The leaves are much smaller and narrower than those of the Southern Kauri (*A. robusta*). Aboriginal name, "Togoi." Wood of a light colour, strong, and durable, easy to work, useful for joiners and cabinet-makers.

111.* *Podocarpus pedunculata*, *Bail.* (Plate CXLIV.) The Black Pine is fairly plentiful in some parts, but not in places where sawmills are situated, as the timber is thought highly of for flooring work. Aboriginal name, "Choopoola." Bark dark-coloured, leaves long and narrow like those of the "She Pine" (*P. elata*) of South Queensland. Male catkins 3 together on a short stalk. Fruit globose, nearly 1 in. in diameter, but only shells, picked up from beneath the trees, procurable at the time of my visit. Said to be ripe in December.

INDEX.

(*Vernacular names in Italics.*)

| | No. | | No. |
|---------------------|--------|--------------------------------|-----|
| Acacia | 42 | Blepharocarya | 38 |
| Acronychia | 14-18 | Bloodwood | 54 |
| Agathis | 110 | Blue Gum | 50 |
| Aleurites | 101 | Boodyarra | 24 |
| Alphitonia | 31 | Boogoochi | 11 |
| Alstonia | 76, 77 | Boomlan | 87 |
| Amoora | 22 | Broad-leaved Poplar Gum | 51 |
| Aphananthe | 106 | Brown Silky Oak | 95 |
| Apodytes | 29 | Bunjebah | 14 |
| Ash | 27 | Bunji Bunji | 27 |
| Beloghia | 103 | Burdekin Plum | 40 |
| Bally Gum | 38 | Callarrie | 37 |
| Bean-tree | 41 | Callitris | 109 |
| Blackbutt | 48 | Callistemon | 46 |
| Black Pine | 111 | Calophyllum | 3 |
| Black Walnut | 84 | Candle-nut | 101 |

Plate CXLIV.



PODOCARPUS PEDUNCULATA, Bail.

INDEX—continued.

| | No. | | No. |
|---------------------------------|----------|--------------------------|--------|
| Cardwellia | 97 | Marragiddie | 90 |
| Cardwell Maple | 26 | Melia | 20 |
| Carnarvonia | 93 | Moiary | 72 |
| Cartalagoor | 69 | Moorgun | 9 |
| Casuarilla Bark | 102 | Moorgool | 62 |
| Castanospermum | 41 | Moreton Bay Ash | 56 |
| Castanospora | 33 | Myristica | 81 |
| Casuarina | 107, 108 | Myrsine | 71 |
| Cedar | 25 | Myrtus | 60 |
| Codreia | 25 | Nappalla | 101 |
| Chalagar | 94 | Narroo | 26 |
| Chalgun | 96 | Native Nutmeg | 81 |
| Chambin | 36 | Native Orange | 30 |
| Chandally | 72 | Native Tammarind | 32 |
| Chargir | 38 | Nephelium | 37 |
| Cheedingnan | 82 | Niah | 93 |
| Choolo-Choolo | 58 | Olea | 75 |
| Choopoola | 111 | Panax | 67, 68 |
| Citron-scented Gum | 55 | Peirir | 4 |
| Coorangooloo | 10 | Phyllanthus | 100 |
| Croton | 102 | Pigeon-berry Ash | 75 |
| Crow's-foot Elm | 4 | Pittosporum | 2 |
| Cryptocarya | 84-87 | Pleioygnium | 40 |
| Cupania | 34 | Podocarpus | 111 |
| Cupress Pine | 109 | Pygeum | 43 |
| Daphnandra | 82, 83 | Quandong | 9 |
| Darlingia | 94, 95 | Ratonia | 35, 36 |
| Davidsonia | 44 | Red Ash | 31 |
| Davidsonian Plum | 44 | Red Beech | 26 |
| Diplanthera | 79 | Red Bottle Brush | 46 |
| Diploglottis | 32 | Red Oak | 93 |
| Duboisia | 78 | Red Silky Oak | 99 |
| Dysoxylon | 21 | Red Stringybark | 53 |
| Echinocarpus | 6-8 | Red Walnut | 86 |
| Elæocarpus | 9, 10 | Rhodamnia | 59 |
| Embothrium | 99 | Rosewood | 23 |
| Endiandra | 88, 89 | Sassafras | 82 |
| Eucalyptus | 47-56 | Scrub Blue Gum | 52 |
| Eugenia | 61-66 | Scrub Bloodwood | 103 |
| Euroschinus | 39 | Scrub Ebony | 7 |
| Evodia | 11 | Scrub Ironwood | 60 |
| Flindersia | 26-28 | Scrub Mahogany | 64 |
| Forest Mahogany | 53 | Scrub Redwood | 45 |
| Forest Oak | 108 | Scrub Tea-tree | 66 |
| Galbulimima | 1 | She Oak | 107 |
| Geijera | 13 | Sideroxylon | 72, 73 |
| Ghittoe | 19 | Silky Oak | 94-97 |
| Gmelina | 80 | Sipbonodon | 30 |
| Grevillea | 92 | Stenocarpus | 98 |
| Halfordia | 19 | Stringybark | 47 |
| Hearnia | 24 | Syncarpia | 57 |
| Hollandsea | 96 | Synoum | 23 |
| Ironbark | 49 | Tarrietia | 4, 5 |
| Ironwood | 30 | Teak | 3 |
| Jimmie Jimmie | 22 | Thorny Yellowwood | 12 |
| Johnstone River Hardwood | 85 | Timonius | 70 |
| Kalaara | 60 | Toeah | 80 |
| Kamela | 104 | Togoi | 110 |
| Kauri | 110 | Turpentine | 57 |
| Kot-ie | 84 | Wargoon-Wargoon | 66 |
| Kokare | 39 | Wac-kay | 41 |
| Koojoongaroo | 85 | Wanga | 25 |
| Koorparrie | 67 | Water Gum | 46 |
| Koorkabidgan | 59 | Weinmannia | 45 |
| Koorool | 76 | White Apple | 62 |
| Kurroonbah | 81 | White Beech | 80 |
| Litsea | 90, 91 | White Cedar | 20 |
| Maba | 74 | White Pine | 76 |
| Maiden's Blush | 6 | White Silky Oak | 98 |
| Mallotus | 104, 105 | Woorboon | 65 |
| Mangoor | 60 | Xanthostemon | 58 |
| Marlea | 69 | Zanthoxylon | 12 |

Apiculture.

BEE-KEEPING.

CHECKING SWARMING.

MR. PAUL H. L. TARDENT, of Ormont's Apiary, Roma, says on this subject:—As I have only kept bees for about five years, I do not assume any authority. I have been successful in checking swarming by cutting out all queen-cells every eight days, by giving plenty of room, and in warm weather by raising the hive from the bottom board on 4-inch blocks. I prefer not to use queen-excluding honey-boards, as in a good honey flow the brood chamber often gets crowded, and the bees swarm for want of laying room. In a very good season some kind of a honey-board would probably be necessary to prevent top and bottom storeys getting waxed together. If I was buying frames to-morrow, I would only have Hoffmann's or some other equally good self-spacing frames: no jarring and crushing of combs and bees when carrying bodies about, also regular combs. I had a colony with two queens last year. I presume they were mother and daughter, as the oldest-looking (to me) was clipped. I, unfortunately, made no further note of the matter. I am afraid that many of us beekeepers meddle too much with our stocks in winter and early spring. I went to a lot of trouble with my bees this winter, but they do not seem to be as advanced as I should wish them to be. On the other hand, I purchased half a dozen hives lately from a man who had not touched his bees at all this season. Taken on an average, they were in a far better condition than mine. We should see that each hive has a laying queen and 25lb. or 30 lb. of stores in autumn, and then leave them alone, cosy, till the warm weather returns. Entrance feeders could be used to stimulate brood-rearing in early spring. *Re* marketing, I have so far only supplied local demands, but, in view of the future and of other bee-men, it would be interesting to know how the honey is got in France, Germany, &c. We are willing and anxious to learn (I hope I am speaking for the majority). Tin is certainly the cheapest and handiest package; glass the most attractive. The question of grading is a serious one. I think it almost impossible to obtain a uniform grade with our varied flora. Some attempt, however, should be made to eradicate the so-called *Eucalyptus* taint idea from the minds of the home public. Chili is one of our most formidable rivals in honey export, yet, unless I am much mistaken, apiculture is much more advanced in these colonies than there.

Tropical Industries.

THE WORLD'S COFFEE TRADE.

INCREASING SUPPLIES AND FALLING PRICES.

How to regulate the world's supply of coffee, so as to prevent the unsettling of prices by the dumping of the "bouncer" crops of good years on the markets, is a problem (says the *Mexican Herald*) that is occupying the attention of great dealers as well as of large producers. In food crops, as well as in fibre crops, the tendency is to larger annual yields in excess of the growth of the world's population; hence the tendency to lower prices for these great staples of nourishment and clothing. Brazil is the great coffee-exporting country, and the history of the Brazilian trade begins at Rio Janeiro in 1817, when 63,986 bags were shipped. In 1832 the figures stood at 478,950 bags; in 1840, 1,000,000 bags were reached; in 1851 the figures exceeded 2,000,000

bags, and kept at that average until 1875, when exports amounted to over 3,000,000 bags. In 1881 the highest mark was attained at 4,377,418 bags. In later years the number began to decline, owing to the exhaustion of the productive power of the trees in the old districts. At Santos the records go back to 1850, when nearly 100,000 bags left that port. In 1871 the exports had grown to 500,000 bags; in 1877 to 1,000,000 bags; they increased in 1884 to 2,000,000 bags; in 1890 to 3,000,000 bags; in 1894 to 4,000,000 bags; in 1896 to 5,000,000 bags; in 1897-98 to 6,000,000 bags, near which figure production in that district is likely to maintain itself as long as the present economic conditions prevail, although the area available for coffee-planting in the State is practically inexhaustible, and no soil more appropriate for the purpose exists in the world.

For 1898-99 the Rio and Santos crops are estimated at 8,500,000 bags, and the visible supply—meaning the stocks in Rio, Santos, afloat and in the public warehouses in Europe and the United States—had increased to 6,576,000 bags on the 1st January, 1899.

How prices have ranged and the visible supply has varied, the following table makes clear:—

| | | | | | Visible Supply of Coffee in Thousands of Bags. | New York Price of No. 7 Rio Gold. |
|------------------|-----|-----|-----|-----|--|---|
| July | ... | ... | ... | ... | — | — |
| 1892 | ... | ... | ... | ... | 2,955 | 13½ |
| 1893 | ... | ... | ... | ... | 3,101 | 16½ |
| 1894 | ... | ... | ... | ... | 2,146 | 17½ |
| 1895 | ... | ... | ... | ... | 3,116 | 16½ |
| 1896 | ... | ... | ... | ... | 2,588 | 13½ |
| 1897 | ... | ... | ... | ... | 3,976 | 7½ |
| 1898 | ... | ... | ... | ... | 5,438 | 6½ |
| 1899 (estimated) | ... | ... | ... | ... | 6,700 | — |

It is proposed in Brazil that a great coffee trust be formed limiting the exportation of coffee from the producing countries; and in the March issue of the *Bulletin of American Republics*, Señor Olavarria, of Venezuela, proposes the establishment of a trust with a central committee in continuous session in one of the European capitals, which would from time to time send to each one of the countries in the league instructions as to the amount of coffee that it might export in a season. The Government of each country in the league is to enter into a solemn covenant to implicitly obey the committee's directions. Señor Olavarria proposes that this league should be immediately formed by a congress of economists of each of the countries concerned, which should meet in Washington as soon as possible. He predicts as a result of the operation of his plan the greatest benefit to the manufacturing and exporting interests of the United States and of their customers, the coffee-growing countries of South America.

THE FUTURE OF COFFEE.

THE *American Grocer* writes as follows:—The news received last week of injury to the Santos crop from frost demonstrated the sensitiveness of the coffee market when any sudden or unexpected disaster, such as a heavy frost or crop failure, is reported which may so change the relation of supply to demand as to advance prices rapidly.

For the last two years everything that has happened has told against the coffee market, and prices have gradually sunk lower and lower in consequence, so that now anything that may happen to next year's crop will naturally work a complete change in the aspect of the market, and must certainly be in its favour. Prices, as we all know, are abnormally low at the present time, and with the possibility of a duty being placed on coffee, and the probability that interior stocks are very light—all point to a steady market in the future, if not to a considerable advance in prices.

The large interests in the trade, however, seem to be opposed to any advance, so that the question now is, Can one or two large factors depress the market against the general opinion in the markets of the world as to the present price of coffee?

Some of the older dealers will remember the jump in prices which occurred between June, 1886, and the same month the following year. In 1886 the price remained almost stationary around 8 cents, while in the year 1887 prices fluctuated widely, so that between the months of June in the two years there was a difference of $13\frac{1}{4}$ cents per lb.

There were two causes for the extreme variation in prices. In the first place, the predictions of the following year's (1887) Brazil crop were distinctly disappointing, being but 3,000,000 bags against 6,000,000 bags in 1886, and this gave rise to a speculative movement which carried prices to an extremely high figure.

History repeats itself. What was then possible under peculiar conditions may occur again: the market treated to another sudden and extreme rise in prices, particularly if any serious disaster comes to the growing crops. Recent events make it reasonable to suppose that the market has about touched the lowest point for No. 7 Rio coffee for some time to come.

In order to illustrate the great fluctuation that the New York market has experienced, let us quote the following comparative prices of No. 7 Rio, from 1884 to the present year, inclusive, as follows:—

| June— | | Cents. | June— | | Cents. |
|-------|-----|-----------------|-------|-----|-----------------|
| 1884 | ... | 8 | 1892 | ... | $11\frac{3}{4}$ |
| 1885 | ... | $6\frac{3}{4}$ | 1893 | ... | $15\frac{3}{4}$ |
| 1886 | ... | $7\frac{1}{2}$ | 1894 | ... | $15\frac{3}{4}$ |
| 1887 | ... | $20\frac{3}{4}$ | 1895 | ... | $14\frac{1}{4}$ |
| 1888 | ... | $11\frac{3}{4}$ | 1896 | ... | $12\frac{1}{4}$ |
| 1889 | ... | $13\frac{1}{4}$ | 1897 | ... | $6\frac{3}{4}$ |
| 1890 | ... | $16\frac{3}{4}$ | 1898 | ... | $6\frac{1}{4}$ |
| 1891 | ... | $16\frac{1}{4}$ | 1899 | ... | 6 |

COFFEE-LEAF DISEASE AND SEED IMPORTATION.

LAST July a packet of seeds from India forwarded to a resident of Queensland was seized and confiscated by the Post Office authorities in Brisbane. The consignee protested against the seizure on the grounds that the seeds in question came under the head of "grain," against the importation of which there is no prohibition. The matter is one which deserves the earnest attention not only of planters and agriculturists but of the whole community as a body. We have begun an industry in the colony which is rapidly expanding and which promises ere long to rise to great importance. This is the coffee-planting industry. Few people need to be told that, whilst many years ago coffee-planting was the principal industry in Ceylon, at the present day coffee in that island is a thing of the past, owing to the ravages of the parasitic fungus (*Hemileia vastatrix*) known as the coffee-leaf disease. Of late years spasmodic attempts have been made to revive the industry, but without avail. The existence of quantities of wild coffee in the jungle operates against the planters. The disease remaining with the wild plants cannot be eradicated, and what was once a source of great wealth to the planters and consequent prosperity to Ceylon has had to be finally abandoned, and cinchona, cacao, and tea have successively taken the place of coffee.

It will be seen how very necessary it was to make stringent laws against the possible introduction of the disease into the young plantations in this colony, and to carry out those rules regardless of sentiment. The following report of Mr. H. Tryon, Entomologist to the Queensland Department of Agriculture, shows that the disease may be imported in various ways, and particularly

by the vehicle of seeds. As he points out in another report, "gram" is a "seed," and not a "grain" or cereal. It is as much a seed as a bean or pea, and the Regulations under "*The Diseases in Plants Act of 1896*" absolutely prohibit the importation of all trees, plants, fruits, or seeds from India, Ceylon, the East Indies, East African Colonies, and from all other countries in which the coffee-leaf disease is known to exist, although the Minister for Agriculture may, at his discretion, import any such plants or seeds which shall, when so imported, be suitably disinfected and detained and grown in close quarantine for not less than 12 calendar months. The following is Mr. Tryon's report:—

The fact of a package of seeds in process of importation into the colony from India having been seized by the postal authorities at Brisbane, in accordance with Regulation 2 of "*The Diseases in Plants Act of 1896*," may serve as an occasion for dwelling upon the circumstances that have given rise to the existence of the legal enactment under which this action has been taken.

1. The coffee-growing industry of Ceylon has, in the past, been practically wiped out owing to the occurrence of a leaf disease caused by a parasitic fungus, technically designated *Hemileia vastatrix*.

2. The parasite occasioning the malady in question presents, amongst other features, the following characters:—Its seeds, or spores, are exceedingly numerous, are minute, occur externally upon the host-plant, and with facility become detached. Accordingly they are capable of becoming transported long distances by the wind, and, being thus brought in contact with foreign objects, adhere through being endowed with a specially roughened exterior. Hence they may be conveyed to remote countries upon portions of plants or other matters that have not at any time been connected with the trees upon which in the course of the development of the fungus they have arisen. And insomuch as they have also a most persistent vitality, and readily germinate after the lapse of many weeks under favourable circumstances of warmth and moisture, the origin of the disease in centres, in which its presence has not previously been remarked, is accounted for.

The facility with which the active agent in occasioning the disease may thus become widely disseminated has, with little doubt, resulted in the fact that, since its appearance in Ceylon, *Hemileia* has been reported on coffee in Continental India, Mauritius, Samoa, Fiji, Java, Sumatra, New Guinea, Natal, German East Africa, and Guatemala (Hennings), though not at the present day, it is thought, existent in all of these countries.

In the case of its occurrence in Fiji, Sir William Macgregor, who had exceptional opportunities for investigating the subject at the time, pronounced the opinion that it had been brought from Ceylon, its spores having accidentally become attached to the charcoal in which seeds had been packed. So in the case of German East Africa, its origin was traced to seeds imported from India.

Moreover, the possibility of its introduction on plants or seeds into new coffee-growing countries is now recognised by both scientific writers and planters alike. Thus the celebrated plant pathologist of Brazil, Professor F. Noack, includes the leaf disease in his "*Molestias das plantas Culturæas propagadas pela importação de Sementes emudas*," published at S. Paulo em Campinas in 1898.

And, moreover, regulations, similar in effect to the one in force in Queensland, have been brought into operation both in Jamaica and British Central Africa. In the latter instance the prohibitive measures, that were promoted through the action of the Planters' Association of the Shire Highlands, were, prior to being made law, submitted by the Foreign Office to the Director of the Royal Gardens, Kew, who, in reporting on the matter, expressed himself as follows:—"I am always reluctant to concur in regulations which must have a restrictive effect, even if small, on commercial enterprise. But in the present case it is impossible to accept the risk of ruining an important and developing industry, which is an important factor in the successful colonisation of British Central Africa. It appears to me that Her Majesty's Government

have no choice but to follow the precedent already set in the case of Jamaica," "Bulletin of Miscellaneous Information," No. 84, cccl., December, 1893.] It is understood that, under the regulations alluded to as relating to British Central Africa, action has been taken in preventing the introduction of the seeds of shade trees from India.

The case of Queensland, with regard to its coffee industry, is precisely that of the last-mentioned British territory, with the exception that with respect to this colony public opinion is less enlightened as to the desirability of upholding the law with regard to the prohibition under review, and, moreover, the opportunity for evading it is greater.

In the case of one fungus disease occurring within a circumscribed area in the Cairns district, there are grounds for concluding not only that it is identical with a malady of the coffee-plant occurring in India, but also that it has been imported on seeds from that country.

As, however, the countries in which the *Hemileia vastatrix* leaf disease is more or less prevalent can provide us with new and commercially valuable economic plants, whose growth in Queensland might possibly contribute largely to develop its agricultural resources, their capabilities in this direction need not necessarily be disregarded. Hence the discretionary power vested in the Minister by the regulation under notice. But importations of the nature and sources contemplated should alone be made under special safeguards. To this end it is recommended that the assistance of the Director of the Royal Gardens, Kew, be invoked. This great establishment has, for some years past, paid continuous attention to the subject of leaf disease, and is fully alive to the importance of developing the tropical industries of the dependencies of the Crown, in which work it has in the past laboured so successfully. Moreover, owing to its important and numerous agencies throughout the world, it possesses exceptional facilities for meeting any demand that might be made upon its resources.

TENACITY OF LIFE OF THE COFFEE PLANT.

MR. D. BUCHANAN, late manager of the State Experiment Farm at Mackay, mentions the wonderful tenacity of life in the coffee plant. During the cyclone of February, 1898, the plants here (at the farm) were levelled by a cyclone from the south-east. Two-thirds of them were killed outright, but all those that had any roots left were hauled up and fastened to strong stakes. They were almost leafless and fruitless, for the ground was strewn with both leaves and green fruit. They appeared to be total wrecks. By January, 1899, they had made young wood 13 to 14 inches long, with fine large dark-green foliage, and were fast filling up the south-east sides of the stems that had been stripped of branches. Then came the second cyclone at the end of last January. This time from a point west of north. Although the bushes were tied to the post with strong tarred twine, the fury of the gale so chafed the twine that most of them were blown down again, and this time the roots were broken on the opposite side. Several plants had all their roots broken off, and of course were taken away, but where it was seen that there was still a root intact they were pulled up again and secured to fresh stakes, and by the end of May they had shoots 20 inches long, fine dark foliage, and what berries were left were plump and ripening well. No doubt what saved them was the fact that they had made fresh roots on the south-east side, and these being flexible were not broken when the plants were blown down from the north-west.

THE RUBBER INDUSTRY.

As settlement progresses in the far North of Queensland and in New Guinea, there is little doubt that the attention of the new generation of settlers will be largely directed to rubber. Thanks to the indomitable energy of the late Lieutenant-Governor of the latter Possession (Sir William Macgregor),

large areas of land suitable for the cultivation of different kinds of rubber-trees have been discovered, whilst quantities of indigenous trees have been shown to exist on the island, and have already been utilised by white men commercially. In December, 1897, we showed that the getting of rubber in New Guinea was a very paying business. We then mentioned the case of a rubber trader who arrived in Sydney with two tons of New Guinea rubber. It had cost him £200 from the tree to the market. In Sydney he disposed of it at 3s. per lb.—that is £336 per ton. The Fly River Syndicate (N.G.) took specimens of rubber from their trees to the same market, and were offered £200 per ton as per sample, two or three months ahead, no matter what might be the then state of the market. The Fly River Syndicate consists of two or three enterprising New South Welshmen, who leased a four square mile island on the Fly River, where the rubber-tree grows profusely indigenously. This they at once began to stock with young trees from Java and Ceylon—trees that will yield 3 lb. of rubber juice in two years.

It may be remembered that some years ago a plantation (Esmeralda) of Ceara rubber-trees (*Manihot Glaziovii*) was formed at Mourilyan Harbour, in North Queensland. But the site was badly chosen, and after a time a cyclone utterly destroyed most of the trees. This discouraged the owners, and the plantation was allowed to revert to its original wild state. It is, however, ascertained that, from the few trees which survived, hundreds of seeds have fallen to the ground and have germinated, and quantities of young trees are to be found beneath the older ones, which are now about 18 years old.

The most valuable rubber is obtained from the *Hevea brasiliensis*, producing the Pará rubber, worth about 3s. 7d. per lb.

In Mexico the tree most planted is the *Castilloa elastica*, acknowledged to be the best of the rubber-bearing trees from a planter's point of view. From all the reports which have reached us from reliable sources, it seems clear that there is money in rubber-growing, provided it is done systematically and on a sufficiently large scale, with plenty of capital for a start.

The *India-rubber World* says that a profit of 300 per cent. is what may be expected from eight-year-old trees. The *Irrawaddy Gazette* says: "Some idea may be formed of the profitable nature of the trade when we say that 100,000 trees produce at a low estimate an annual revenue, after deducting expenses, of from £25,000 to £30,000."

The *Ceylon Tropical Agriculturist*, some little time ago (1897), gave the profit in Nicaragua, which may arise at the end of the eighth year (on 100,000 trees) at £44,337 10s., and of the ninth year at £47,620, on an original net capital outlay of £3,625. The Government premium is 3d. per tree.

The Mexican Government grants a subsidy to the owners of the Llano de Juarez of 3 cents for every rubber-tree planted which attains a certain growth up to a limit of 15,000,000 trees—equal to about £3,000 per 1,000,000; the trees to be planted at the rate of 1,050,000 per annum.

At the present time the Mexican Gulf Agricultural Company have on their property, known as the "Dos Rios" plantation, 100,000 rubber-trees four years old, 100,000 three years old, 200,000 two years old, and propose putting out 200,000 per annum for the next three years, which will complete a total of 1,000,000 trees. The Mexican Tropical Planters' Company (an allied company) expect to put out on their own plantations 100,000 rubber-trees this year, and a similar number for their investors, for whom they are doing work in that vicinity.

For exhaustive information on rubber-planting all over the tropical world, we refer our readers to Vol. I. of this *Journal*, 1897, and Vol. II., 1898, and particularly to "Notes on the New Guinea Rubber Industry," by the Hon. A. Musgrave, Government Secretary, and Mr. A. C. English, Government Agent for the Rigo district, New Guinea, who has planted 25 acres of indigenous rubber-trees, the "Makimaki" (*Ficus rigo*), see p. 483, Vol. II., June, 1898.

Mr. M. H. Lewis, general manager of the Gulf Agricultural Company, has communicated to the *India-rubber World* the following very interesting article on

RUBBER-PLANTING IN MEXICO.

In compliance with your request, I will cheerfully give you such information as I possess regarding rubber in this district, gleaned from four years' experience in planting 300,000 trees here at Dos Rios and carefully observing the rubber in other portions of this locality. I refer entirely to the *Castilloa elastica*, as no other variety grows here, either wild or cultivated. That it is indigenous to the country is proved by the number of trees found growing wild in the forest. I believe this to be the only variety in Mexico, and the same that is sometimes called "Panama" rubber. We recently secured 2,000 seeds of Pará rubber, but only six plants sprouted, and these soon died. I understand that this rubber requires low, wet land, combined with an extreme degree of heat, only flourishing where man cannot well exist. *Castilloa elastica*, on the contrary, requires well-drained land and climatic conditions similar to those for coffee, which are generally conducive to health and comfort. It will do well with a rainfall ranging anywhere between 50 and 150 inches per annum, and a temperature averaging between 70 degrees and 85 degrees Fahr.

The republic of Mexico unquestionably contains thousands of acres of land possessing in a remarkable degree every requirement in the way of soil and climate to make it perfectly adapted to the successful cultivation of this valuable product; and to no portion of the republic does this apply more forcibly than the Isthmus of Tehuantepec. "Tropical Mexico" is a large country, however, and contains bad land as well as good, and I would advise an inspection of lands by competent parties before closing a purchase. There are instances where large sums of money have been sunk in huge wastes, purchased simply because they were *cheap*, or in the belief that land worthless for any other purpose would grow rubber. There was never a greater mistake. *Castilloa elastica* does not necessarily require as rich ground, nor as much moisture, as does coffee, but it is fully as essential that the land be well drained, for "wet feet" are as injurious to one as to the other. I have seen young rubber apparently doing well upon land practically exhausted by tobacco; likewise on land heavy with clay, and again on soil consisting almost entirely of sand; but I have never yet seen it growing on *wet* land, or *old* trees bearing well on anything but what had been rich, friable, virgin forest land at the time the trees were put out.

Rubber cultivation is not a difficult undertaking, and no great amount of experience or scientific education is necessary. Patience and a reasonable amount of common "horse-sense" are the chief requisites, after the necessary capital and proper lands have been provided. I would advise the "tenderfoot" to spend at least six months studying the successes and failures (particularly the latter) of some older planter before starting in on his enterprise, and to use his eyes rather than his ears.

Rubber seed for nursery purposes can be secured in large quantities in June and July, from several localities on the isthmus, at an average price of 1 dollar per lb. It is extremely delicate, and no time should be lost in transferring from trees to nursery, and great care exercised in its transportation. If allowed to get dry, the parchment will break, thereby preventing germination; if too wet, or allowed to heat, the seed will rot. The cost of raising one-year-old nursery plants is 15 dollars per 1,000. This includes the cost of clearing and preparing the ground, purchase, transportation, and planting of the seed, weeding until plants are pulled, pulling, trimming, counting, and bundling the plants. They cannot usually be bought, but when possible it is advisable for the beginner to buy his plants, thereby saving a year's time and avoiding all risk in connection with the nursery. No dependence can be placed on getting seedlings from the forest, nor are they desirable, on account of crooked trunks and roots.

There is a great diversity of opinion as to how the rubber shall be planted whether under light or heavy shade, or with no shade at all; also at what distance apart the trees should be placed. We have planted ours from 16 to 18 feet apart each way, in among the coffee-trees and under light shade. Our soil

is very deep and rich, and easily able to support both of these products, as well as that portion of the original forest left for shade. This means a saving of land and a doubling of its earning capacity. The same weeding serves for both products, and I believe that, by keeping the soil always moist by means of the combined shade of the forest trees and coffee plants, the life of the rubber-tree will be incalculably extended, its yield of sap increased, and the quality enhanced, with no consequent detriment to either the coffee plants or their product. On the other hand, rubber set out in the sun grows faster and can be tapped earlier than that under shade, and for the first 12 or 18 months "catch crops," such as corn, beans, and tobacco, can be planted in among the trees, the profits therefrom offsetting the constant and heavy expense of keeping down a rank growth of grass and weeds.

The cost of clearing, rowing, staking, and planting rubber alone, without coffee, under forest shade, putting 150 plants to the acre, including the cost of the plants, is in this immediate locality 36 dollars per acre, and it will cost 12 dollars per acre each year for the following seven years to replant and weed, at the end of which time the trees should be ready to tap, having cost 120 dollars per acre or 80 cents each.

Planted in the sun, 15 feet apart each way, or 200 to the acre, the cost is 60 dollars, with an expense of 40 dollars for the first year for replanting and weeding, and an average cost of 20 dollars for weeding each year until the rubber is ready to tap—usually when six years old. The total cost would thus be 200 dollars per acre, or 1 dollar per tree, less any profit resulting from "catch crops."

All of the above figures are in Mexican silver, worth to-day 49½ cents, United States currency (2s. 0½d.). They include management and living expenses, but nothing for cost of land, buildings, interest on invested capital, &c. Field labour figured at 85 cents, silver—50 cents for wages and 35 cents for keep. Of course the cost of doing this work will naturally vary in different districts, but these figures will apply very accurately to most of the forest lands of the gulf slope.

Just what the yield would be from a six or eight year old rubber plantation, when properly planted, cultivated, and tapped, has yet to be demonstrated on the isthmus. None of the plantations owned by foreigners have attained that age, and those of the natives are poor criterions. They are rarely, if ever, weeded; the trees generally improperly tapped at irregular intervals, and frequently at the wrong time; and the sap invariably collected and cured in the crudest manner. No estimates are made of the crop or the cost of harvesting it. However, by means of careful inquiries and a systematic tapping of selected trees of all ages throughout the different districts, it has been possible to arrive at a comparatively accurate knowledge of what can reasonably be expected. One-half pound of high-grade, clean rubber can be counted upon with certainty from eight-year-old trees, and ½-lb. increase every year thereafter until the trees are yielding 5 lb. each. At present prices the planters net 80 cents per lb., silver. This means a profit of 80 dollars per acre from eight-year-old plants, 400 dollars per acre four years later, and 800 dollars per acre when the trees are in full bearing; and this return should continue without any shrinkage for at least 25 years. These estimates are conservative in the extreme, and the prospective purchaser can rest assured of seeing them fully realised, with a possibility of their being doubled.

The isthmus rubber, both wild and cultivated, has been favourably passed upon by experts in New York, London, and Hamburg, and a great deal of it sold in American and European ports at prices comparing well with the best rubber on the market, taking into consideration its crude preparation. As in the case of coffee, badly cured and dirty rubber is subject to a heavy discount, out of proportion to its intrinsic value.

Castilloa elastica, on the isthmus at least, has no enemies in the way of insects or diseases. There is no export duty, and the Mexican Government

provides every protection to life and property. Therefore, taking everything into consideration, it is my firm conviction that the cultivation of rubber on the Isthmus of Tehuantepec is an extremely safe and highly profitable investment.

Mr. Lewis added that the figures of cost given in the article include the managing expenses—which is not always the case in estimates on this subject—in order to give persons not familiar with conditions in Mexico a fair knowledge of the true cost and amount of capital required for this class of investment.—*India-rubber World*.

CARDAMOMS (*ELLATARIA CARDAMOMUM*).

By JOHN DANSEY.

THE Cardamoms of commerce are of two varieties, known as Malabar and Mysore; the former bearing capsules of from $\frac{1}{4}$ to $\frac{1}{2}$ inch long, the latter of about 1 inch in length. In appearance the plant much resembles ginger, but, unlike the latter, the flowering stalks spring from the roots. These yield the fruit, which consists of triangular three-celled capsules, enclosing numbers of small angular seeds possessing a very strong aromatic odour and a pungent flavour.

Cardamoms are in much request throughout the East Indies, and amongst chemists, all over the world, command a ready market.

For years past, the principal supplies of Cardamoms have been obtained from Southern India, but latterly from several parts of Ceylon, where, with their usual energy and perseverance, planters have taken up their cultivation on a large scale, and with considerable benefit to themselves.

In Ceylon, Cardamoms grow well at elevations of from 1,500 to 4,000 feet. Slightly undulating lands, near the banks of streams, the soil of which is a rich and moist loam, will be found most suitable to their growth.

For the propagation of this plant nursery beds should be prepared in the usual manner, and the seed sown in drills from 6 to 8 inches apart. These seeds are slow of germination, from two to three months elapsing before they show above ground. When the plants are of about 12 months' growth, and about 12 to 15 inches high, they may be said to be fit for transplanting.

Having cut away the undergrowth and all small trees growing on the land on which it is the intention to plant—leaving only sufficient standing timber to afford a moderate shade—holes, 1 foot 6 inches deep and 2 feet wide, should then be dug at distances of about 5 feet apart, in which, after being filled in the usual manner, the young seedlings are planted; care being taken that they are not put in too deep, for, if so, they are likely to rot and die off. The second year after planting out they will yield their maiden crop, and in the third may be said to be in full bearing, when an acre should yield on an average from 200 lb. to 270 lb. per annum, though 350 lb. to 375 lb. are not unknown. The crop itself should be gathered when still green, and just before turning to a yellowish straw colour, for should the capsules be allowed to ripen they will at once "pop," and the seed be lost.

The fruit when fit for gathering resembles as nearly as possible a green gooseberry, only that, instead of growing away from the stem as gooseberries do, these spring from a thin long vine as grapes do, but growing always along the ground, and for this reason mulching of any kind, after the plant has attained maturity, should be avoided.

In harvesting Cardamoms of either variety, it is necessary to go over the field at least twice a week and pick off the full capsules only. These, when gathered, should be carefully washed in two waters, so as to remove all sand and impurities, which, from the nature of the fruit growing along the ground, are bound more or less to adhere to it; this having been done, place them in the sun to dry, turning them carefully once or twice in the meantime. Care should here be taken only to allow just sufficient time to dry; too much exposure to

the sun will cause the capsules to split and lose their contents. When quite dry, spread the fruit out in a loft and allow it to wither for from 12 to 15 hours.

Cardamoms, to be made marketable, require to be bleached. This, though seemingly ridiculously easy, requires nevertheless a good deal of watching, for, should the fruit be too long exposed to the process, the seeds will attain a light brownish colour, instead of their natural black, and lose much in value. For the purpose of bleaching, it will be necessary to have ready, by the time the withering process has been completed, a wooden box, much resembling a sentry box (as airtight as possible), with slides so as to admit a number of trays, bottomed with thin Hessian, to be inserted therein at distances of from 8 to 10 inches apart. The withering being completed, dip the Cardamoms in water for a few moments; then place them on the trays to the depth of from 2 to 3 inches. When all the trays have been treated alike, place on the ground inside the box, and not within less than 2 feet of the lowest tray, a bucket or some such receptacle containing burning charcoal, over which, when all is ready, throw a full handful of powdered sulphur. Then close the door quickly and as tightly as possible, and allow the bleaching to go on for from 15 to 20 minutes, when the door may be opened, and the trays emptied out on to some clean Hessian, and the contents allowed to dry thoroughly in the sun. When dry, the ends of the capsules are taken off with the aid of a sharp scissors; they are then sized and packed for market, preferably in lead-lined boxes, as many shipping companies object strongly to carry Cardamoms, unless so packed, on account of their strong aromatic odour.

NOTES ON CANAIGRE.

(Translated from the *Revue des Cultures Coloniales*.)

CANAIGRE may be cultivated on arid soils, as it requires only one-third of the quantity of water per acre necessary for fruits or cereals, and even still less, if the water supply is limited, the rains of a winter being sufficient for its ordinary requirements. This plant cannot be injured either by heat, cold, wind, disease, or insects.

Canaigre requires a light siliceous soil, rich in nitrogen and with a good easterly aspect; fogs and very heavy frosts are its enemies.

In many places where the plant is cultivated, in the United States, such conditions do not exist, and the yield is in consequence much reduced.

Canaigre grows during the winter—October to April (in Europe)*—when the first rains give the soil the humidity necessary for its development. The best season for planting the tubers is September or October.† They are set at distances of 1 foot apart in the rows, the latter being 2 feet apart. The crown alone of the tubers germinate, consequently there is no advantage in cutting them, as is done in the case of potatoes, for example.

The seeds produced in the early summer only produce very small tubers in the first year, and sowing them would hardly pay.

Once the tubers are planted, they increase rapidly in size and weight, and form bunches.

If there is no great demand for the produce—if some other cause prevents the harvesting at the proper time for a good market—the roots can remain in the ground for a year or two, and will continue to increase in size and value at the rate of 25 dollars per annum.

* April to September, in Queensland.

† March or April, in Queensland.

The cost of cultivation and harvesting would be about 104 francs (£4 6s. 8d.) per acre, and each acre will produce 10 tons of roots.

Some farmers say it is preferable to dig the roots every year; others assert that the two-year harvest is the most profitable, as the cost of cultivation and harvesting are no greater for two years than for one, and as the weight of the tubers is increased the cost on the return per ton is proportionately less. Bark for tanning purposes is becoming more and more difficult to procure; and importations having to be made into Europe as well as into the Dominion of Canada, Mexico, and the States of South America, the development of the cultivation of Canaigre should be assured, as this plant, unlike bark, does not require several generations to produce. A ton of fresh Canaigre roots would, moreover, contain as much tannin as a ton of oak bark or of Canadian hemlock.

Canaigre roots scarcely cost more than 20 francs (16s. 8d.) per ton to the tanners established on tropical coasts, near a centre of production, whilst the same quantity of bark would cost them 30 francs (25s.) if not more.

Of late years great quantities of wild Canaigre tubers have been dug in New Mexico and the East of Texas, which have been sliced, dried, and exported to Europe. This industry is undoubtedly developing itself, but it is in the cultivated product. The price of roots, sliced and dried, would be at least 185 francs (£7 14s. 2d.) per ton of 2,000 lb. on the Hamburg market.

The principal obstacle to the general adoption of dried Canaigre roots for leather tanning has been, up to the present, the cost of freight from the producing localities to the tanneries, but, for some years, a concentrated extract of Canaigre has been made, which is of small volume, and consequently costs little in freight. It is soluble in hot water, and is exported generally in boxes of 240 lb. net weight.

The extract of Canaigre can be combined with extracts of bark or with any other agency for tanning hides, and has the recognised property of raising the grain and increasing their toughness. It makes the leather pliable—a property much desired in light leathers—renders coarse hides full and heavy, and gives them a beautiful orange colour.

The extract of Canaigre mentioned in this note will combine with salts even, and yet not destroy the tannin. By the use of this extract, splendid leathers (harness and sole) are produced in the proportion of 64½ lb. per 100 lb. of fresh green hides.

A ton of concentrated extracts represents 2½ tons of dried roots, and contains 48 per cent. of tannin. Large imports of this product have been received in France at 90 dollars per ton delivered at Havre, but such a price is too high for the product to be generally used.

The manufacturers in this country hope to reduce the price to 60 dollars per ton, which would represent only 2 dollars per cent. per ton of sliced and dried tubers, requiring 3 tons of fresh roots.

The first manufactory established at Denning (New Mexico) pays the farmers for fresh roots delivered on the railway trucks 5 dollars per ton.

During the last four years the extract of Canaigre has been used by the most competent tanners of Europe, who recognised that it had all the essential properties of gambier, which only contains 36 per cent. of tannin, and that the price, relatively high, was amply compensated for by its value in the tanyard.

An English company, at Kialto, near San Bernardino (California), cultivates 3,000 acres of Canaigre, and has two factories for preparing it for export—one in Arizona, the other in New Jersey.

Forestry.

SOME TIMBER TREES OF QUEENSLAND.

By J. W. FAWCETT,

Member of the English Arboricultural Society.

THE SILVER-LEAVED IRONBARK (*Eucalyptus melanophloia*, F. v. M.)

BOTANICAL DESCRIPTION.—The Silver-leaved Ironbark is a medium-sized tree, attaining a height of from 30 to 60 or 70 feet, with a diameter of from 18 to 24 inches or more, and having a somewhat stunted appearance, the trunk being generally crooked and twisted. The foliage is more or less glaucous or mealy-white.

Bark.—The bark is of a blackish, or dark-grey, colour, persistent, rugged, and very deeply furrowed, and from $\frac{1}{4}$ to $\frac{3}{4}$ inch in thickness.

Branches.—The branches are crooked, and give the tree a spreading crown or head.

Leaves.—The leaves are opposite, sessile or stalkless, cordate-ovate or somewhat globular in shape, and of a mealy-white or silvery-green colour.

Flowers.—The flowers are from 3 to 6 in number, very small, and of a greenish-white or yellow colour. They appear in bloom from November to January, and are arranged either in axillary peduncles or form a terminal panicle.

Fruit.—The fruit is a small and somewhat globular truncate or pear-shaped capsule from $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter.

VERNACULAR AND BOTANICAL NAMES.—The Silver-leaved Ironbark (so called from the colour of its leaves) is also called the Broad-leaved Ironbark (from the shape of the leaves). The specific name, *melanophloia*, was given to this species by Baron Mueller from the great contrast existing between the blackish trunk and the mealy-white foliage. This contrast is very striking, and gives the tree a very noticeable appearance.

DISTRIBUTION.—The Silver-leaved Ironbark is found growing in open forest country, and especially on barren and stony ridges, and is common to both North and South Queensland and the northern parts of New South Wales.

USES.—The Silver-leaved Ironbark yields a closely-grained timber, with a reddish heartwood and a greyish sapwood. It is very soft when first cut, but as it dries it gradually becomes hard, and is then strong and durable. When growing on very poor lands and on stony ridges, the trunk is generally hollow. When obtained with sound straight trunks, it is used for telegraph poles. It is used, at times, for railway sleepers, and also for fencing and other purposes. The timber of this tree is, however, unless well seasoned, very apt to split when constantly exposed to the sun. It is generally supposed to be inferior to that of other ironbarks. The flowers are a great favourite with bees, who seem to prefer them to the other species of Eucalypts when different trees are in bloom at the same time. The honey from them is one of the brightest and finest of Eucalyptus honeys.

THE QUEENSLAND BLUE GUM (*Eucalyptus tereticornis*, Sm.)

BOTANICAL DESCRIPTION.—The Queensland Blue Gum is a tall, handsome tree of large size, growing to a height of from 60 to 90 or 100 feet in ordinary localities, with a diameter of from 18 to 36 inches. In more favourable and suitable habitats it attains the exceptional height of 150 and 160 feet, with a trunk diameter of 4 or more feet. It has, generally, a massive trunk and spreading branches.

Bark.—The bark is deciduous, and of a smooth, bluish, whitish or ashen colour. It peels off in thin, ragged flakes or ribbons, and leaves patches of a grey, or dark-red, or sometimes of a bluish-red, or slaty-red hue. As on every tree the bark is generally hanging in ragged shreds, exposing the inner bark, these give the tree an untidy appearance.

Leaves.—The leaves are alternate and opposite, lanceolate, falcate, and acuminate, from 2 or 3 to as much as 6 inches in length, and from 1 to 2 inches wide, with somewhat coarse oblique veins.

Flowers.—The flowers are from 4 to 8 in number, in axillary or lateral peduncles, the upper ones forming a terminal panicle. They are of a creamy or whitish colour, and are in blossom from July to September. This tree is one of the most constant as to the annual flowering period, and its flowers are much sought after by bees.

Fruit.—The fruit is an ovoid or almost globular capsule, about $\frac{1}{4}$ -inch in diameter. It seeds in April and May.

Though distinguished by its bark, the broad and very prominent rim of the fruit, and the timber, this tree is subject to great variation in the shape of the leaves, the length of the operculum or flower-lid, and the size of the capsule; whilst, in moist places, the umbel often exceeds the typical number of flowers. It is closely allied to *E. rostrata*, Schl. (the Red Gum-tree), but the two trees differ altogether in habit—one being a forest tree, the other a river tree.

VERNACULAR AND BOTANICAL NAMES.—The Queensland Blue Gum possesses a variety of names. The name "Blue Gum" is applied to it from the supposed blue colour of the bark, and as this is the name by which it is best known in this colony I have appended the adjective "Queensland" to it, to distinguish it from the blue gums of the other colonies, each of which unfortunately for description possesses one. It is also known as Grey Gum (from the colour of the inner bark after the outer bark has peeled off), Red Gum (from the colour of its timber), Slaty Gum (from the slaty-coloured bark), and Bastard Box (probably from the timber being very close-grained and interlocked, certainly not because of any resemblance of its bark to that of the box). The specific name, *tereticornis*, was given to this species by Sir J. E. Smith, founder of the Linnaean Society, from the resemblance of the operculum or flower-lid to a long horn.

DISTRIBUTION.—The Queensland Blue Gum is found luxuriating in well-watered open forests, and on good land bordering creeks and rivers, lagoons, marshes, and swamps on both sides of the Dividing Range in Queensland as far north as the Herberton tablelands, and also in the coastal districts of New South Wales and Victoria.

USES.—The Queensland Blue Gum yields a valuable close-grained, heavy, tough, durable, reddish or pinkish timber, not very easy, however, to dress. It is used for building and many other purposes, such as plough beams, poles and shafts of drays, and owing to its elasticity is specially adapted and much esteemed for naves and felloes of wheels, and is also suitable for gun carriages. It is used in shipbuilding and for railway ties and girders. Where ironbark cannot be procured, it is usually used for posts and rails and general fencing purposes. As posts, it seldom decays from dry rot, whilst round posts withstand for a long while the attacks of the white ants. For railway sleepers and telegraph poles it is inferior to several of the other species of ironbark. Whether in or out of the ground it is very durable, and less liable to decay by dry rot than many other timbers. If obtained from the banks of rivers or off alluvial ground—for it is on these places that it attains its greatest perfection—and properly dried and seasoned, it will remain sounder underground for a longer period than on the top. It furnishes only a very inferior fuel, burning with great difficulty.

The bark contains but a small quantity of tannin—less than 8 per cent.

The honey produced by the flowers of this tree is of a pale-amber colour, and has a delightful musky perfume.

This is a useful species to plant for commercial purposes. It grows well, and in 25 years has been known to reach a height of from 40 to 75 feet, with a diameter of from 10 to 14 inches or more. It does not produce blossoms until it is about 10 years of age.

THE POPLAR-LEAVED BOX (*Eucalyptus populifolia*, Hook.)

BOTANICAL DESCRIPTION.—The Poplar-leaved Box is a moderate-sized tree, growing to a height of from 30 to 50 feet, with a diameter ranging from 12 to 30 inches.

Bark.—The bark is a greyish white, closely persistent and somewhat spongy.

Leaves.—The leaves are of a glossy green colour, rhomboidal in shape, usually from 1½ to 3 inches broad, shortly acuminate, very thick, and arranged on longish petioles or stalks.

Flowers.—The flowers are very small, and are arranged in paniculate umbels, each umbel having either few or many flowers.

Fruit.—The fruit are small capsules.

This tree has often been mistaken for the Red Box (*E. polyanthema*, Sch.), but it differs from it in having all its stamens (or male organs) fertile and its anthers (or pollen bag) with more lateral (or side) openings. The filaments (or stalks which support the anthers) are usually darker coloured, and the fruit is smaller. Besides these differences, the Poplar-leaved Box is found only in the warmer parts of Eastern Australia, while the Red Box occurs as far south as the colder parts of Victoria, and is not found in Queensland.

VERNACULAR AND BOTANICAL NAMES.—The Poplar-leaved Box, so called from its leaves resembling those of the European poplar, is also known as the Poplar Box and the Poplar Gum, and the Shining-leaved Box—from its having a green shining appearance—and White Gum; the last name is more generally used in New South Wales. It is also known under the aboriginal name of Bembil. The specific name, *populifolia*, was given to this species by the British botanist, Sir W. J. Hooker, on account of its poplar-like leaves.

DISTRIBUTION.—The Poplar-leaved Box is found growing generally on poorer soils, both in the coastal and inland districts of Queensland, and is also found in the northern parts of New South Wales.

USES.—The Poplar-leaved Box yields a very hard and tough, strong, durable, good, useful, greyish or lightish brown timber. Though very hard to work, it is a very handsome wood when polished. It is especially adapted for use in dry and hot climates. It is used for handspikes, levers, posts, and other articles where toughness is required. It is also useful in house and ship building, and for poles and shafts of drays.

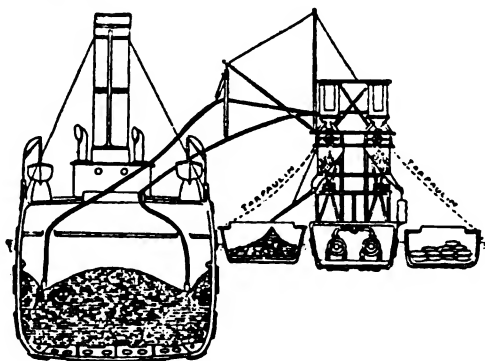
RINGBARKING AND RAINFALL.

THE amount of water absorbed by large trees is very considerable, and hence ringbarking has a marked effect on the grass. The destruction of heavy timber over a large area of country has, notwithstanding all that has been said to the contrary, the effect of reducing the rainfall, particularly in flat country. But the water beneath the surface, which went to nourish the growing trees, is, after the latter are destroyed, left to nourish by capillary attraction the roots of the grass, which grows more luxuriantly in consequence. Not unfrequently springs burst forth spontaneously in ringbarked country, owing to the superabundance of subterranean water now no longer expended in supplying the trees.

General Notes.

HANDLING WHEAT.

WHERE wheat has to be handled in large quantities, the Americans have a very smart way of going about the business. The cheap carriage of wheat from the interior of the United States to the seaboard, along the many extensive waterways which intersect the States, is attributable to this system as much as to the means. The wheat is shipped in bulk, not in bags. Wheat does not flow quite as easily as water, and does not quite find its level; but it is so mobile that it will flow freely down a slight declivity, and can be pumped up by buckets or by suction. It is this quality that has been seized upon, and forms the basis of



the elevator system so much in vogue across the Atlantic. By this system the farmer conveys his grain in bags or in bulk to the elevator. These are emptied into a weighing hopper, and from this hopper it flows to the elevator buckets or is taken to the storage bins. When ready to be shipped, the wheat flows by gravity through spouts into box cars or enclosed railway trucks with a special fitting to the doors for holding the grain. In this way 1,000 bushels can be loaded in five minutes. It is then conveyed by rail to the waterside. The doors are opened, and the grain is emptied by steam shovels, operated by two men, into a receptacle beneath the train. Then the wheat finds its way into the hold of a steamer or barge, and after being carried to the coast is re-transferred to other vessels by the bucket system or the suction pump. This method may sound involved, but it effects an enormous saving, despite the cost of elevator sheds and their mechanical fittings.—*Farmer and Stockbreeder*.

SISAL HEMP AT MACKAY.

A FARMER in this district—Mr. Kadditz, of Mount Vince—has become bold enough to make a leap from the sugar-cane rut, and has begun to extensively plant Sisal Hemp. He has obtained three drayloads of young plants, and intends to plant as many as he can get in the district, which will be a good many tons. It is to be hoped that his example will stimulate others to plant, as the success of the venture will much depend upon the quantity that can be sent to market, for if a regular supply is not sent to London the dealers will not trouble about it. But Mr. Kadditz is looking at it from another point of view. He thinks, and possibly correctly, that Queensland can take all the ropes he can manufacture for some time to come. He has not tried the *Furcraea* (Mauritius Hemp) yet, but anyone wishing to start its cultivation can be supplied with plants by the thousand from the State Nursery.

MACARONI WHEATS.

REVERTING to the subject of macaroni wheats, which we mentioned in our last issue of the *Journal*, on the authority of Mr. G. Valder, Principal of the Hawkesbury Agricultural College, New South Wales, as being a desirable crop for farmers in the coast districts, we find that, despite some adverse criticism on the part of some agricultural journals in the southern colony, Mr. Valder's idea is now favourably looked upon. *Farm and Garden* for 12th August says:—"Mr. Valder, the Principal of the Hawkesbury Agricultural College, having raised the subject of macaroni wheats, it is interesting to know how this particular description of grain stands in its home on the shores of the Mediterranean. In several European countries, principally Italy, Spain, and France, the different forms of edible pastes known as macaroni, spaghetti, vermicelli, nouilles, &c., are produced in very large quantities. From a small and somewhat local business it has become a large, prosperous, and constantly increasing industry, upon which millions of people depend for their food. It is estimated that the French output of these pastes is from 120,000,000 lb. to 170,000,000 lb. per annum, and this product is unquestionably destined to increase greatly. The kind of wheat that is wanted for the manufacture of these pastes is a hard wheat, containing a large percentage of gluten and a relatively small percentage of starch. Rapidity of growth and ripening is considered of prime importance in the production of the desired qualities in the wheat. If it be remembered that the French people eat more bread than any people in the world; that, generally, France needs very little ordinary wheat, but that she always will need a very considerable percentage of hard wheat—"hard" not being, however, understood in the Australian sense in France—although we considered that the suggested manufacture of macaroni in New South Wales was somewhat premature, the exportation of macaroni wheats to the Mediterranean may possibly be worth a trial."

[In many German houses the "nouilles" mentioned above are made as required. They are called "nudel," and nudel soup is a favourite in that country. They are made of macaroni wheat flour, rolled out into a thin paste, and cut into narrow strips, which are used in the soup in the same manner as the macaroni of commerce.—Ed. *Q.A.J.*]

DESTROYING PRICKLY PEAR.

MR. H. L. CAFLISCH, a selector at Yingerbay, writes to the *Roma Star* as follows:—"There are many things more or less severe upon the pear, but the cheapest I have found as yet is bluestone—the ordinary kind used in pickling wheat. It can be obtained from any storekeeper, and is 6d. per lb. In treating the pear it is only necessary to powder the bluestone, cut a slit in a few of the leaves—the number depends upon the size of the plant—and put about a quarter of a spoonful of the bluestone in each slit. In three days the plant will droop, gradually turn black, and finally dry up like brown paper. In three or four weeks the roots will be dead, and the whole can then be pulled up without any difficulty. I hope the information will be of use to your readers.

It is stated that arsenic and washing soda have the same effect used in the same manner, if powdered and used half-and-half.

Mr. James Polson, Rockhampton, has been experimenting with "skin-and-hide" poison, and finds it very effective. It is cheap, and is used for dressing cattle for ticks. The proportions are 1 gallon of poison to 30 gallons of water. He states that both the above remedies are very destructive to prickly pear and burrs.

A WALLABY TRAP.

MR. JAMES WILSON, Edenfield, Clifton, sends us a plan of a vermin yard, which he thinks would be useful for trapping wallabies. It consists of a yard of any size which may suit the selector. In one side of the fence there are two openings about a couple of feet wide. These openings are fenced on each side,

and run diagonally for a distance of about 6 yards into the yard, when they terminate in a narrow opening sufficient to allow a wallaby to pass in, but not large enough for him to easily return, even if he could find the opening by which he entered. The plan is a simple one, and would be worth trying in localities where wallabies are numerous.

ASPARAGUS.

THE *Agricultural Gazette* (London) has the following on growing asparagus. We doubt, however, whether the method here advocated of growing the root close to the surface would be beneficial in our warm climate:—

A friend said to me lately, "You and I are the only two people who cut asparagus at the level of the ground." If so, few people are sensible. I cut when 5 or 6 inches high; but in very hot weather, if a cutting has been neglected, I find it nearly 1 foot high, and I cut it in two; the lower part often as tender as the top. When I give any away I say, "Now, mind you eat every bit, or I shall grudge my gift," and they tell me that they did. Asparagus, then, has some taste.

And now I will add a little advice that may be new to some, because not on the old fashion. Since the plant spreads its roots horizontally at about 6 inches below surface, the old plan of making beds 1 foot or 2 feet deep of rich matter is useless. Let the soil be rich to just below the level of the roots, and every autumn top-dress when the haulm is removed ripe. The roots, as in the case of vines, want to be near the surface for warmth.

In making a new bed, let it be away from all bushes and the like. It is a jealous plant. And let every bed be of one single line of plants about 2 feet apart from one another. The stools will then in time put up immense numbers of big shoots. I sow and grow on the flat. While the plants or stools are growing (a matter of years), other vegetables may be grown at a reasonable but increasing distance. The asparagus should be the monarch of all it surveys.

REMEDY FOR FLIES.

It is a troublesome question to know what to do with the flies this summer. This is the best method of destroying them that we know of. Take half-a-teaspoonful of black pepper in powder, 1 teaspoonful of brown sugar, and 1 teaspoonful of cream; mix them well together, and place in the room on a plate when the flies are troublesome, and they will soon disappear. Cold green tea made very strong and sweetened with sugar will also, where set about the room in saucers, attract flies and destroy them.

SHOEING GEESE.

ACCORDING to a consular report issued recently, a regular "goose market" takes place at Warsaw during the month of October, through which some 3,000,000 geese pass, some for consumption at Warsaw, but most for export to Germany. One-third of the geese come from the Government of Vilna, and many more have come long distances, which would ruin their feet, to prevent which they are "shod," as it is called, before setting out on their journey to Warsaw—that is, they are driven first through tar poured on the ground, and then through sand. After this operation has been repeated several times, their feet become covered with a hard crust which protects them during their long march on hard ground.

FRUIT PROPAGATION EXTRAORDINARY.

"OUT AND HOME" says that the crofters of Mull and Iona have come by a number of strong fruit trees in a most remarkable manner. Apples from the wreck of the Dominion liner, "Labrador," were strewn in profusion along the high-water mark of the spring tides, and thousands of the pips had germinated

and taken root. When the seedlings were discovered they were already from 2 to 5 inches in height, and the crofters lost no time in transplanting those which looked the strongest and most vigorous to their gardens, where they are now thriving young trees.

It is, in the light of this fact, quite possible that some of the seeds of the many thousands of apples, pears, lemons, and oranges, which have been condemned by our fruit inspectors and cast into Moreton Bay, may have, in a similar way, germinated and taken root on the coast of the mainland or on some of the islands towards the North. It is well known that pie-melons many years ago could be found growing wild along the Northern coasts, evidently being the produce of seeds thrown overboard from some passing vessel. As to the salt water injuring the seeds, it would appear that in the case under notice it had no injurious effect whatever.

JUDGING POTATOES.

POTATOES hitherto have been judged by their size, smoothness, evenness, colour, and by other points visible in the raw product. It has remained for Jamaica judges to prove the goodness of the potato by a practical test. At Kingston, in June last, four judges sat down to a table covered with dishes of boiled potatoes. A well-known practical cook took charge of the preparation of the tubers for the table, and dished them up to perfection. The lots were carefully numbered and boiled in separate utensils, and came to the table in perfect condition. Then two curious things happened. One lot appeared so laughing and mellow that all instantly said, "That's the winner already." The other thing was that lot No. 1, taken first, kept ahead all the time, and won first place, whilst the fine-looking lot came in badly, having a strong earthy taste. This lot, which came to the table so beautifully mellow and tempting-looking, had one first prize at Kingston Show.

This was a novel competition, and one which might with advantage be introduced into Queensland. Many varieties of potatoes look excellent whilst in the raw state, but "the proof of the potato is in the cooking," and many first-prize takers at our shows might, if placed in the hands of a first-rate cook, prove to be unworthy of a place on the table.



TO PREVENT BIRDS SITTING ON GRAFTS.

WE have often had cause to lament the breaking down of a graft by the perching thereon of heavy birds. Now, here is a simple way of affording the succulent graft perfect protection. Bend a piece of cane or green willow over the graft, as shown in the diagram. You will have no further trouble.

A RUBBER-EXTRACTING MACHINE.

THE *Jamaica Agricultural Journal* says:—A practical machine for extracting rubber from any part of the rubber-tree, twigs, branches, trunk or roots, and one which has satisfactorily stood test, is now being manufactured in large quantities, and put on the market at about £7 each. Probably our Jamaica milk withe could be profitably utilised by the aid of this machine.

A GOOD MANURE FOR TOMATOES.

IF tomatoes are heavily manured late in the development of the plant, fruiting will be delayed. Nitrate of soda has been found to increase the yield 35 to 60 per cent., but it should be used in connection with other manures, as phosphoric acid and potash are also required, and these increase the yield and improve the quality of the fruit. Superphosphate has been found to hasten the maturing of the fruit. A good manure is made up as follows:—Two parts nitrate of soda, two parts bonemeal, three parts kainit, and four parts superphosphate. Apply 1 oz. per square yard of soil once a week from the time that the plants are established till the fruit has set.

AN ANT EXTERMINATOR.

WITH the approach of summer, the ants of various kinds will begin once more to trouble the householder. The latest method of destruction is said to be the use of gasoline. Pour about a half-pint of gasoline into the ant hill or nest, and set it afire. The gasoline will instantly spread through all the nest, and, as the heat on the surface increases, the gas will generate from the utmost recesses, and the fire will cook the ants. Half-a-pint of gasoline will burn from three to eight hours, and kill every ant in the largest nest, as well as all which attempt to enter it from without.

TOMATO PULP FOR EXPORT.

THE Minister for Agriculture, New South Wales (says the *Tenterfield Star*), has ascertained that there is an extensive demand for tomato pulp in England. He is surprised to think there should be any possible necessity to obtain tomato pulp from a country like Canada, when in some parts of New South Wales tomatoes grow most luxuriantly, and even wild. Inquiries have been received in Canada from a house in England for large quantities of tomato pulp. The pulp must be put up in sealed tins, and must be free from acids and preservatives of any kind. This may open up new possibilities for the tomato industry—to what extent can only be ascertained by actual experiment. It is to be hoped that persons will be found sufficiently enterprising to interest themselves in a practical way in the matter. Mr. J. S. Larke, the Canadian Trade Commissioner in Australia, in his last report to the Department of Trade and Commerce, pointed out that there was a maker of sauce in Australia who wanted tomato pulp, for which he was willing to pay 50 dollars per ton.

CANNING STRAWBERRIES.

THE strawberry season being now in full swing, some growers might be anxious to try canning the fruit whole. Here is a recipe given by a practical man in the *Pacific Rural Press*:—First, select nice berries in prime condition. If necessary wash them. To 1 lb. of granulated sugar use sufficient water to moisten the sugar. Place on stove and let come to a good boil, skimming well of all impurities. Now drop in about six drops of lemon juice, and let boil until it hairs. To this amount of syrup add 1 lb. of the berries, and let boil slowly for five minutes. Take from the stove, cover and let stand in a cool place six or eight hours. At the end of that time cleanse your bottle with hot water and fill with the berries. Overflow the jars with syrup and seal tight. On the scientific principle that two bodies cannot occupy the same space at the same time—in canning any fruit, overflow the bottles with the syrup of the fruit and seal

immediately. We should first fill the jars about one-fourth full of the berries, and then work them down on the sides with a silverplated knife, so as to fill the jar compactly with the fruit and expel all air then. Do not stir the syrup after it boils, but by putting in a few agate marbles they will act as an automatic stirrer and prevent the syrup from burning. Should the jars not be airtight, dip a piece of writing paper in warm brandy, place on top of liquid, and over this place a layer of cotton batting. This will prevent the berries fermenting. Raspberries canned in this way are also very nice.

CANNING TOMATOES.

ALL who have tried the following method pronounce it the most successful of any they have used:—Scald the tomatoes, dipping them first in hot water one minute, then in cold water one minute, then remove the skins. Place in the jars either whole or sliced, packing closely by working down on sides with silver knife. Fill the jars full, put on rubbers, and screw the lids part way down. Place your boiler on the stove, put in the bottom of it a perforated tin, on which place your jars, and fill boiler with lukewarm water sufficient to cover as far as the neck of the jars. As soon as the water boils, steam 10 minutes. Then take out one jar at a time, screw lid on airtight, and replace in boiler. When all have been replaced, steam 18 minutes longer, being careful to have the water completely cover the bottles this time. At the end of that, remove the jars, allow them to cool, and screw the lids on tighter if possible.

BLUESTONE AS A MEDICINE FOR DOMESTIC ANIMALS.

A FARMER has been poisoning wheat to destroy sparrows with bluestone. The fowls found the wheat and picked it all up, yet no fowls died. Was the bluestone merely a fraudulent imitation? No. It was probably sulphate of copper, but a solution of 1 lb. of bluestone to 6 gallons of water is employed for destroying the *Strongylus contortus*, a wire worm which infests the fourth stomach of sheep and goats. It is not the quantity of bluestone swallowed, but the improper strength of a solution, which may kill an animal by causing acute inflammation of the stomach and bowels. The bluestone should first be dissolved in two or more bottles full of boiling water, and then the remaining cold water is to be added. No iron vessel must be used, as bluestone acts injuriously on it. Wood or earthenware vessels should be employed.

The doses, as given by Mr. D. Hutcheon, C.V.S., in the *Agricultural Journal of the Cape of Good Hope*, are:—

| | Age. | Quantity of Mixture, |
|---------------|-----------|-------------------------------------|
| Kids or lambs | 3 months, | 6 drachms or 1 large tablespoonful. |
| " " | 6 " | 1½ ounce or 2 large tablespoonsful. |
| " " | 12 " | 2½ " 3 " " |
| Goat or sheep | 18 " | 3 " 4 " " |
| " " | 24 " | 3½ to 4,, 4½ to 5 " " |

MAIZE IN VICTORIA.

GIPPSLAND has a moister climate than most parts of Victoria, and hence is able to produce larger crops of maize. Some 30,000 bags are annually sent from the Snowy River in barges to its mouth, where the corn is loaded into small schooners for conveyance to Melbourne. The cost of picking is 4d. per bag. In good seasons and on good land the crop may reach 80 bushels per acre. In open, clear paddocks the planter, such as may be seen at the Queensland Agricultural College, is used, the wire being stretched right across the field, and the knots on it 30 inches apart. One farmer settled on the river says that for ensilage purposes he can raise 40 tons of green maizestalks per acre, but this very fact prevents much being made into ensilage owing to the cost of handling.

A BICYCLE SHEEP-SHEARER.

At the late meeting of the Royal Agricultural Society of England, held at Maidstone, amongst other new agricultural implements exhibited was one for clipping horses and shearing sheep, of which latter machine the *British Trade Journal* reports:—

The silver medal of the Royal Agricultural Society was awarded to the Barton-Gillette Horse-clipping and Sheep-shearing Company for their "Bicycle Shearer." This machine is constructed to shear two sheep or clip two horses at the same time, and the necessary driving power is given by a lad seated at the rear of the machine, pedalling the driving-wheel in cycling fashion. The machine, being fitted with ball bearings in all parts where friction may be thus lessened, enables a boy of fourteen to drive it with ease. Considerable interest in this exhibit was manifested by the judges, stewards, and the general public. It may be mentioned that the model "A" machine referred to has been sold to His Highness the Khedive of Egypt. It is fitted with an improved sharpening wheel, enabling the user to sharpen his sheep knives himself, instead of losing time by sending the blades to the maker.

But the chief attraction of the Barton-Gillette Company's exhibit was the practical demonstrations of machine shearing given at intervals each day. The power used for driving was provided by a very pretty little oil engine supplied by Messrs. Priestman and Co. On a raised stand—where four men can shear at once—the shearers were at work, and the interested crowds saw heavily woolled sheep denuded of their fleecy coats in less than five minutes each.

These machines have been in great demand the past few weeks amongst the sheep-farmers of the United Kingdom. The company's standard horse-clipping machines (all these machines are adapted to either shearing or clipping) were also shown. That excellent stable requisite, the Model B, has won its own way into the Royal stables. The L.C.C. has just placed a large order with the company for machines to use in their stables, in addition to those in use by the tramway company for the past two seasons.

In the above report there are two sources of motive power mentioned. For, while a boy on a bicycle contrivance supplies power for two shears and shearers, oil engines or any other power may be applied to drive any number of horse-clippers or sheep-shearing instruments. We need scarcely say that the cutting portion of these instruments is one of the same kind as first invented by the Rev. Mr. Bell in the construction of his horse-reaper, and now used for mowing grass, cutting hair, clipping horses, and shearing sheep.

GERMINATING COFFEE SEED.

A CENTRAL African planter writes that some two or three months ago he soaked some coffee-berries for planting in nursery; putting them in a 2-lb. tin, with water (tight lid). After three or four days they were planted out; but some 200 or 300 berries were left in the tin, which contained enough water to cover the seeds completely. A full fortnight afterwards he opened the tin, examined the seeds, and it appeared that some showed signs of growing. He planted them out at once to try and see whether they would really grow and thought that, if they did, something interesting may be discovered for minimising the heavy expenses connected with watering nurseries for two months and more before the longed-for seedlings make their appearance. Some are growing now, those planted the third or fourth day being only a few days ahead of them. He adds:—"They would have appeared sooner had the gardener not buried them too deep, and, being irrigated, much ground washed and settled on the surface into the bargain, which was removed a few days ago, and the coffee made their appearance at once. We must remember that the seeds were in an almost *airtight* tin, and, besides, under water, and the tin was kept in a cool place and got only a little morning sun."

PREVENTION OF WEEVIL.

A FARMER, writing to the *New York Tribune*, says :—Eight years ago I lost about one-third of my crop of corn and cow peas on account of the weevil, but luckily I made a discovery that has been worth many dollars to me since. During the same year I sacked up a lot of cow peas, and about one-fourth of the sacks used were salt sacks, with the salt still clinging to them. When I was ready to market the peas I unsacked the lot, and found to my surprise that the peas in the salt sacks were in perfect condition, while those in the other sacks were almost destroyed by the weevil. When I gathered my grain crops the next fall I used salt sacks entirely with the same success. It is the custom in this section to put the corn in the barn with the shuck on, and the consequence is that a great many insects secrete themselves in the shuck and afterwards destroy a great deal of grain. Knowing this I dissolved 1 quart of salt in 2 gallons of water, and as the corn was thrown in the barn I gave it a light sprinkling. I was not bothered with any insects that year, and of course I have continued to use the salt remedy ever since with the best of results.

THE LIME-WATER PRESERVATIVE FOR EGGS.

PLACE 4 lb. of unslacked lime, 1 lb. of salt, and 1 oz. of cream of tartar in an earthen jar; then add 3 gallons of boiling water, stir well and allow the mixture to stand for two days, when it is ready to receive the eggs. The vessel should stand in a cool place where it is not likely to be disturbed. There should be quite 2 inches of the liquid standing above the top layer of eggs. As the water evaporates, add cold water up to where it previously stood in the vessel.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR AUGUST.

| Article. | | | | | | | | AUGUST. | | |
|---------------------|-----|-----|-----|-----|-----|-----|-------|-------------|----|--------------------------------|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bacon | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7 |
| Bran | ... | ... | ... | ... | ... | ... | ton | 5 | 15 | 0 |
| Butter, First | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 11 ³ / ₆ |
| Butter, Second | ... | ... | ... | ... | ... | ... | " | 0 | 0 | 7 ¹ / ₂ |
| Chaff, Mixed | ... | ... | ... | ... | ... | ... | ton | 3 | 12 | 6 |
| Chaff, Oaten | ... | ... | ... | ... | ... | ... | " | 4 | 10 | 0 |
| Chaff, Lucerne | ... | ... | ... | ... | ... | ... | " | 3 | 16 | 6 |
| Chaff, Wheaten | ... | ... | ... | ... | ... | ... | " | 2 | 13 | 0 |
| Cheese | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 6 ³ / ₄ |
| Flour | ... | ... | ... | ... | ... | ... | ton | 9 | 2 | 0 |
| Hay, Oaten | ... | ... | ... | ... | ... | ... | " | 3 | 16 | 0 |
| Hay, Lucerne | ... | ... | ... | ... | ... | ... | " | 2 | 18 | 6 |
| Honey | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 2 |
| Japanese Rice, Bond | ... | ... | ... | ... | ... | ... | ton | 12 | 4 | 0 |
| Maize | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 8 |
| Oats | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 3 |
| Pollard | ... | ... | ... | ... | ... | ... | ton | 5 | 9 | 6 |
| Potatoes | ... | ... | ... | ... | ... | ... | " | 4 | 2 | 0 |
| Potatoes, Sweet | ... | ... | ... | ... | ... | ... | " | 1 | 13 | 0 |
| Pumpkins, Table | ... | ... | ... | ... | ... | ... | " | 1 | 16 | 0 |
| Sugar, White | ... | ... | ... | ... | ... | ... | " | 14 | 10 | 0 |
| Sugar, Yellow | ... | ... | ... | ... | ... | ... | " | 12 | 10 | 0 |
| Sugar, Ration | ... | ... | ... | ... | ... | ... | " | 10 | 18 | 0 |
| Wheat | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 3 |
| Onions | ... | ... | ... | ... | ... | ... | cwt. | 0 | 7 | 11 |
| Hams | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 9 ³ / ₆ |
| Eggs | ... | ... | ... | ... | ... | ... | doz. | 0 | 0 | 6 ³ / ₄ |
| Fowls | ... | ... | ... | ... | ... | ... | pair | 0 | 3 | 11 ¹ / ₂ |
| Geese | ... | ... | ... | ... | ... | ... | " | 0 | 6 | 11 |
| Ducks, English | ... | ... | ... | ... | ... | ... | " | 0 | 4 | 7 ¹ / ₂ |
| Ducks, Muscovy | ... | ... | ... | ... | ... | ... | " | 0 | 5 | 11 |
| Turkeys, Hens | ... | ... | ... | ... | ... | ... | " | 0 | 7 | 6 |
| Turkeys, Gobblers | ... | ... | ... | ... | ... | ... | " | 0 | 16 | 6 |

ENOGGERA SALES.

| Article. | | | | | | | | AUGUST. | | |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-------------|----|--------------------------------|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bullocks | ... | ... | ... | ... | ... | ... | ... | 6 | 16 | 0 |
| Cows | ... | ... | ... | ... | ... | ... | ... | 4 | 7 | 0 |
| Wethers, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 14 | 9 ¹ / ₂ |
| Ewes, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 10 ¹ / ₂ |
| Wethers, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 15 | 11 |
| Ewes, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 14 | 5 |
| Lambs | ... | ... | ... | ... | ... | ... | ... | 0 | 12 | 6 ¹ / ₂ |
| Baconers | ... | ... | ... | ... | ... | ... | ... | | | |
| Porkers | ... | ... | ... | ... | ... | ... | ... | | | |
| Slips | ... | ... | ... | ... | ... | ... | ... | | | |

Orchard Notes for October.

By ALBERT H. BENSON.

KEEP the land well cultivated, and, if dry, see that it is well stirred, but not turned. Attend to the disbudding of all young trees, for, if superfluous growths are checked now, they are converted into fruit-wood, and the vigour of the tree is thrown into those shoots which are to form the future branches of the tree. Disbud all vines, rubbing out all superfluous shoots, leaving only as many canes as the vine is strong enough to mature fruit to perfection on.

Sulphur all vines to prevent oïdium, as, if there is any muggy weather during the month, this disease is sure to make its appearance. Where Black-spot is present, spray the vines with Bordeaux mixture, and if caterpillars are troublesome as well, then add 1 oz. of Paris green to each 2 gallons of Bordeaux mixture, and both pests will be destroyed by the one spraying. When using Bordeaux mixture, there is no necessity to use sulphur for oïdium, as the Bordeaux mixture answers equally as well. Don't spray when the vines are in blossom; but with varieties that are shy setters it is often a good plan to sulphur when in blossom.

The nursery should be carefully attended to; where not already done, the ties of all grafts should be cut and the scions should be trained so as to make a single upright stem. Where buds have been put in, they should be started by cutting back the stock sufficiently to cause them to grow, but the stock should not be cut hard back all at once, but by degrees, always leaving a portion of the stock above the bud to tie the young shoot to. Plant pines and bananas during the month, selecting suckers from healthy plants and from plants that are good croppers, and that produce good fruit, as a careful selection of suckers always pays well. Continue the treatment for Maori or Rust Mite of the orange recommended in the Notes for September; and where orange bugs, either the green or bronze, are present, destroy every mature insect that can be found, so as to prevent them breeding, as the killing off of the first crop will materially lessen their number for the season. Hand-picking, though slow, is probably the best remedy, though, before the insects are fully grown, large numbers may be destroyed by driving them on to the main branches of the tree and sweeping them off with a broom on to a cloth, from which they can be gathered and killed. Take every possible precaution against the fruit fly by destroying every infested fruit that you can. If there are maggots in cumquats or any other fruits, destroy every one, as the cleaner the sweep that is made of the first crop of flies the less trouble there will be throughout the season. Where Scale Insects have been introduced on young trees into clean districts, every care should be taken to keep the pest from spreading; and in cases where the young trees are badly affected, it will pay the grower to destroy them at once, as the first loss will be the least. Where leaf-eating insects of any kind are troublesome—such as caterpillars of kinds, the larvæ of the fig beetles, or the false ladybirds that attack all kinds of cucurbitous plants, potatoes, &c.—they can be readily destroyed by a spraying of Paris green, 1 oz. to 10 gallons of water, with lime added in as large a quantity as can be got through the nozzle of the pump without choking, as this will tend to make the poison stick on better to the leaves, branches, or fruit.

Farm and Garden Notes for October.

Farm Notes.—As the warm weather is now at hand, and showers may be expected, weeds will be on the increase; therefore the horse-hoe and cultivator should be constantly at work in keeping the crops clean. Do not let the weeds get ahead of you and seed, as one year's seeding means seven years' weeding, but keep them down vigorously. Earth up growing crops, and keep the ground loose amongst them. Plant sweet potatoes, yams, earth-nuts, arrow-root, turmeric, ginger. Sow and plant out tobacco. Sow maize, sorghum, setaria, imphee, Kafir corn, Johnson-grass.

Kitchen Garden.—French or kidney beans can now be sown in all parts of the colony. Lima beans are a first-class hot-weather vegetable. The hotter the weather the better the Lima bean likes it. Sow the dwarf kinds in drills 3 feet apart, and 18 inches between the hills, and the climbing kinds 6 feet each way. A few rows of beetroot may still be sown. Cucumbers, marrows, squashes, melons, if not sown last month, ought to be planted at once. If attacked by leaf-eating beetles, spray with Paris green or London purple. Chilies should now be sown in a seed-bed or box, and planted out when large enough. Set out egg-plant in rows 4 feet apart. A few rows of peas may be sown, except in very hot districts. Tomatoes should now be ready to plant out, and this work should be done at once. Plant not less than $3\frac{1}{2}$ feet each way, and provide some means of support, such as stakes or trellis, for the plants. Rosellas, if not already planted, should be set out without delay. Weeds grow very fast now, and the hoe and cultivator must be kept constantly going. When watering is necessary, do as much of it early in the morning or late in the afternoon as possible; and always stir the soil with the hoe the next day, to prevent baking. Nearly all kinds of plants will be benefited by mulching during the hot weather.

Flower Garden.—Plant chrysanthemums, and see that they do not suffer from want of water; also look out for aphids and caterpillars. Now is a good time to plant out palms and all kinds of tropical and semi-tropical plants. If the weather is very hot, water well after planting, and shade for a few days. Dianthus, snap-dragons, &c., can still be planted, and coleus should now be planted in the borders. Roses should now be in full bloom. Keep free from aphids, and cut off all spent flowers. Keep the borders well hoed, and the grass edgings trimmed. Get the lawn-mower out, and keep the grass down. Do as much of your planting as possible now in dull or showery weather.

Cultural Notes for Tropical Queensland.

NOVEMBER.

PLANTING of bananas may be continued. Plant paddy, yams, turmeric, ginger, sugar-cane; apply stable, cowyard, or meatworks manures whenever available. Stake yams. Sugar-cane may be planted. Plant sappan seed and root plants. Olive hedges may be trimmed. Crushing sugar-cane continued. Pineapple crop must be taken off. Bananas and passion-fruit ripen all the year; the latter may be planted at any time, seed being used. Pawpaws (*Carica papaya*) and mangoes are fruiting. This is probably the most important month to Chinese farmers.

The Farmer and the Frost.

"THE king himself is served by the field." Without the farmer, war would be an impossibility. The mining industry, arts and sciences, ship-building, manufactures, and trade and commerce generally, are practically all dependent upon the science and practice of agriculture. The races which neglect the tillage of the soil are those which are the first to be swept into oblivion. We have but to consider any nomadic race, such as were many of the now extinct North American horse Indians, some of the lower African tribes, such as the Hottentots, and all the aboriginal tribes of Australasia. These, whose very existence depended upon war and hunting, have either become extinct or have degenerated into a mere handful of hewers of wood and drawers of water. On the other hand, we find that all nations, whether of aboriginal or colonising extraction, which have made agriculture part of their national employment and wealth, have not only held their own, but have increased and multiplied, and have risen to a foremost position in the world. Without agriculture, everything must come to a standstill.

Recognising the national importance of the cultivation of the soil, most civilised Governments have devoted large sums to the establishment of agricultural colleges, to the introduction of new plants of economic value, to the improvement of breeds of horses, cattle, sheep, pigs, and poultry, and to the appointment of specialists in the various branches of rural economy, to aid and instruct the farmers in the best and most economical modes of cultivation, harvesting, marketing, and stock-breeding. In no branch of pure agriculture have so much pains been taken as in the cultivation of wheat, and this need not be wondered at, for of all field crops, wheat is the most important, serving as it does to supply the principal wants of a very large proportion of the human race.

By careful selection of seed it has almost come about that certain varieties of wheat have become proof against rust. By the same selection it has become possible to produce more wheat per acre than our ancestors dreamed of, and at a cost which appears insignificant in comparison with results. It might be supposed that these results depend on climate and soil, but when one considers all that is known of the various conditions under which wheat is grown, from the cold regions up to the 62nd parallel of north latitude to the torrid zone, in all sorts of climates and on all sorts of soil; when one sees how the crop can vary on the same piece of land from 5 to 50 bushels per acre according to how that piece of land is cultivated, and with but a modest expenditure for chemical manure, one comes to the conclusion, as the French peasant says, that "the land is worth what the man is worth."

Dry clay and river sand, properly manured and irrigated, will yield heavier crops than those of the Darling Downs. All depends on the culture. Where the land is cultivated intensively, as in England, France, and Belgium, heavy crops are obtained. In some districts in Great Britain 40 bushels per acre is the average, whilst 57 bushels have been obtained on allotments, and a record of 60 has been reached. In France, anything over 33½ bushels is considered a satisfactory yield. Kropotkin says that the French farmers' progress in wheat culture may be illustrated by the classical example of a farm of the Thourassin family, not far from Paris. Since 1784 four generations of the same family have succeeded on this estate of 667 acres, and their successive crops were as follow :—

| Year. | | | | Wheat Crops. Bushels per Acre. |
|-----------|-----|-----|-----|--|
| 1784-1810 | ... | ... | ... | 20 to 27 ($\frac{1}{3}$ under fallow) |
| 1810-1836 | ... | ... | ... | 22½ to 38 (no fallow) |
| 1836-1862 | ... | ... | ... | 28 to 46 " " |
| 1862-1877 | ... | ... | ... | 36 to 57 " " |

So much for the effects of good cultivation. What the wheat farmer has to reckon with is the weather—*i.e.*, dry weather after the seed has sprouted, and muggy, wet weather when the ear is formed. In Queensland, wheat is sown from April to July. With genial showers during the growing season, and dry weather towards and during the harvest, the best results accrue. But there have been abnormally dry and abnormally wet seasons, which have dashed the farmer's hopes, and left him with either a scanty crop or with one heavily rusted.

Never in the history of Queensland wheat-growing, however, has such a calamity occurred as a destructive frost in the month of October. At the beginning of that month the wheat crops all over the Darling Downs gave promise of a rich harvest. Far and wide little was to be seen but vast stretches of country waving with billowy crops of wheat and barley just burst into ear. Suddenly, on the 1st and 2nd of the month, when all were rejoicing in the splendid harvest prospects, the calamitous frosts occurred, and shortly afterwards it was found that nearly the whole of the crops on the low lands were hopelessly ruined so far as any expectation of grain was concerned, and the disaster was intensified in some districts by a hailstorm which destroyed what the frosts had spared.

Before such a crushing blow it would be expected that the farmers would be in despair, but, so far from this being the case, with indomitable energy they at once set to work to cut the damaged crops for hay, and, where nothing could be saved, to burn off the destroyed wheat and plough up the ground for a maize crop. Energy such as this is likely to meet with its reward. The Department of Agriculture took immediate steps to assist the farmers. As it was well known that wheat crops cut at the stage to which these had attained are in their finest condition for making a hay even superior to oaten hay in nutritive value, no time was lost in inviting the British Government, through our Agent-General, to place orders with the Agricultural Department in Queensland for a quantity of forage for the use of the troops in South Africa. At the same time investigations were made in the direction of ascertaining the probable quantity of hay which would be available. Inquiries were set on foot as to the probabilities of cargo space in suitable steamers; and information has been also obtained respecting the means available in Brisbane for dumping the farmers' bales and bags. No time has thus been lost in getting all possible information, so that prompt action may be taken in any direction which may be decided upon.

The price of oaten hay in South Africa varies considerably, according to whether the market is inland or at some British port. For instance, at Bloemfontein, the capital of the Orange Free State, it is worth £8 per ton; at Buluwayo, in Rhodesia, £15 15s.; at Durban, in Natal, £12; at Grahamstown, £7; at Johannesburg, £17 10s.; at Kimberley, £10 10s.; at Port Alfred, £6 5s.; and at Port Elizabeth, £9 5s.

These figures are taken from a Cape of Good Hope journal, and they were the prices ruling at those centres on 1st September. Since then war has begun, and there will probably be something like 40,000 horses and mules to feed. Doubtless large quantities of forage will be sent from the southern colonies and New Zealand, but there is no reason why, with a little pluck and energy on the part of our farmers, aided by the efforts of the Department of Agriculture, and by the Railway Department, Queensland should not have a very considerable share in supplying the needful forage. There is plenty of time. The newly cut hay must remain from six to eight weeks in the stack before it will be in fit condition to press and export. Meanwhile it is possible that some definite scheme may be arranged for placing this valuable asset on the South African market. If a clear profit of from £2 to £4 per ton can be made by shipping it, then the seeming calamity will indeed have proved a blessing in disguise, for, once the wheat is off the land, a crop of maize can be sown, and the profit on both hay and maize will reach a far higher figure than if the wheat had remained to be reaped for grain. To those who still are of the opinion that the best proceeding will be to burn off the crop for the sake of enriching the land for a future crop, we would say—hold on a little longer. There is a probability of a good market.

Agriculture.

NOTES ON ROCKHAMPTON AND CENTRAL DISTRICTS.

By S. C. VOLLER,
Department of Agriculture.

As I have spent more than three months at work amongst fruitgrowers and agriculturists in the Rockhampton and Central districts, it may be more or less interesting to the readers of this *Journal* to have put before them a few of the impressions I received of the work at present being done there, and of the possibilities of development in the future.

My first business, on arrival in Rockhampton early in May, was to assist in judging in several classes of exhibits at the annual show.

This, of course, brought me immediately into touch with a good deal of the work and its results, as well as with a good number of the workers or producers; and while some classes of exhibits were more or less disappointing, on account of their meagre representation, others again gave good ground for praise, and inspired hope for still better things to come.

For instance, the farm and dairy sections, although not heavy in the bulk of exhibits, still included a good deal of very decent produce, and proved beyond a doubt that the district is capable of much more in these directions than it has yet accomplished.

Fruit—in which I was most directly interested—was conspicuous by its absence, and this made me wonder what kind of a fruitgrowing district I had got into. However, to do the district justice, I found out shortly afterwards that, although the fruit was not at the show, there was a good deal in the neighbourhood quite worthy of a place on the show tables. Why it was not there I cannot say, but I hope next year's show will tell a different tale.

The exhibits in the dairy stock classes gave ample proof that dairymen and breeders are waking up to the fact that the quality of the dairy herds must be improved as much as possible, in order to reach the highest point of profit in dairy work. I was glad to see some animals of undeniable quality on the ground; and if all who are concerned in this line of work will only keep on going for the best, the Rockhampton Show Ground will, before long, turn out a very satisfactory parade of dairy stock. Unfortunately, the ticks had interfered badly with the condition and appearance of many of the animals shown; and exhibitors deserved the sympathy not only of the judges, but also of the public, in the difficulties under which they were working through this pest.

Farmers and dairymen who have lived and worked only in "clean" districts can form no idea of the trouble and loss caused by the ticks, and I sincerely hope the evil day when they gain actual experience may be a very long time coming.

Fat cattle were not too numerous, but their quality was first-class, and, being an old lover of the "fats," I took a very keen interest in them.

The most fastidious critic could find very little to fall out with in this class. If weight as well as quality were wanted, it was there to the tune of 1,520 lb. dressed, which was the record of the champion ox, while many other great weights were reached by the various animals competing.

I was particularly delighted with some of the "ballies" in the "freezer" pens. I think that for breeding, condition, and general quality as butcher's cattle it would puzzle anyone to fault them anywhere in the world. Then the cows!—fit for any show in the old country, where they think they get real fat cattle, not like our poor Australian stuff! Colour, shape, weight, everything that means *breeding*, was there pretty well to perfection, while the condition was up to anything a cattle-man could want. No lumps, no patches, but every part of the beast covered evenly and thickly.

These cattle have already been described through the public Press, and particulars of weights given, and I need not give these again. I may say, however, that, if proof were wanted of what can be done by natural grasses in Queensland, the fat stock exhibits at Rockhampton ought to satisfy anybody.

I saw several of the prize-winners after slaughtering, and it was then that the wonderful quality and thickness of condition were revealed.

The Peak Downs country was responsible for the cows and the champion heavyweight bullock, but I forget where the "ballies" were fattened.

Other sections of the show I cannot say much about, as I did not give sufficient attention to them.

While on the subject of shows, I may mention that the same society held a second one for fruit, flowers, and vegetables on the 2nd and 3rd August. I again had the honour of acting as judge for fruit and vegetables.

This time, fruit was again in very poor evidence, for which I blame the apathy of the growers mainly. Vegetables, however, were to the fore, in really good fashion, and the display in most of the lines was most gratifying, and really showed how much could be done. Some really good prizes were offered, particularly in the case of collections, and competition was fairly keen in consequence. Rockhampton folk should certainly learn, from the extent and quality of their exhibits on this occasion, that there is no need whatever, during a considerable part of the year at least, for the wholesale importation from the southern colonies of a great many articles they use very largely.

Farming has not yet advanced to anything like a systematic industry in the Central district, and in some ways will always be beset by certain disadvantages, not the least of which is the uncertain rainfall, causing occasional severe dry spells. But against that must be put the fact that, even in bad seasons, the farmer can do very much to counteract adverse conditions by adopting only the very best methods of work on his land.

Then, again, so far as the supply for the consumer is concerned, the Central district is a big place; and while one or more parts of the district may be at a standstill, other sections may be enjoying most satisfactory conditions for general production. This actually occurred this year, as over the coastal half of the country the season was remarkably good, while out West things have been at their very worst.

In the near future, when people get a more systematic grip of their work, and production increases as it is going to do, Rockhampton, and indeed the smaller towns along the Western line, should be well supplied with agricultural produce.

For instance, down along the coast there is a considerable strip of sandy country of marine origin, partly covered by rather low scrub, and partly by forest. A great deal of this land will some day be under cultivation. It is being taken in hand already, and the advantage of it is that it is the easiest stuff in the world to work whence once cleared. One horse can plough it; it is perfectly sweet owing to its saline character; good water can be got at a few feet by sinking; it is always cool and damp underneath, and, being against the sea frontage, is almost entirely free from severe cold in the winter. Manure will be required to maintain the quality after a little while, but it is land that will pay for a little judicious feeding. For early spring crops it is one of the best lines of country I ever met with. I saw on a couple of the homesteads here some most pleasing results in the shape of both fruit and farm crops. Along the coast where heavy ridges or mountains occur there are some very excellent patches of volcanic soil well suited for fruit-production and, in occasional instances, well adapted for farming. Thus at Yeppoon I visited several places which ought, in the course of a few years, to be heard of as thoroughly well-established orangeries. I went over a great deal of that country on instruction work, and a good number of the settlers I met with have uncommonly good opportunities ahead of them. Bananas and pines and several other fruits, as well as the citrus, can and will be grown exclusively and profitably.

One drawback to this part of the country, and indeed to all the country about Rockhampton, is its patchy character. There are miles of it that won't pay for fencing in so far as fruitgrowing is concerned, and settlers need to exercise considerable caution in making a choice of what is to be their home. Too often—sadly too often—we find people settling on a piece of country, and going in for one line of work or another, with the certainty of doing nothing but spending what money they have, and failing utterly in the not distant future. It pays neither the people themselves nor the country to have things going on in this way, and I am of the opinion that it would be vastly better if this Department were first consulted by people in search of land yet lacking the knowledge or experience needed to ensure a safe choice being made. It is a most serious matter for a man to start with his family on a place which he shortly finds is practically useless; and then after he has committed himself, and spent what he had, wake up to an idea of what might have been.

Fruitgrowers in the neighbourhood of Rockhampton have one thing to do now as a start in production, and that is: Stop the importation of bananas and oranges from other ports. I saw on the "Arawatta," when returning from Mackay to Rockhampton, a big consignment of both these fruits, which simply meant, to my mind, that the local growers were a long way behind where they ought to be.

This is a partial reply to the question asked by many I came in contact with—viz., "What about markets when we produce?" Our Queensland growers all through the country don't seem to be capable of looking broadly at things. To hear some of them talk, one would think that the colony had just about reached the limit of her development, and that the outside world was already stocked up with a lot of the commodities which we can very easily produce. A very little study should alter their ideas on these points.

My reply to those who fear that we shall over-produce is—"First feed yourselves and then start feeding the world, and take care that you give the outside world the best article obtainable; then you need have no fear." Who can say what the production and the output will be in a comparatively few years right along our coast country, not only in citrus fruits, pines, bananas, passion-fruit, mangoes, and a number of other things, not only in the raw state, but preserved in various ways. Queensland ought some day to be doing one of the biggest marmalade trades in the world, and other things will come about too, and the Rockhampton country ought to have a share of the business. I for one will be much disappointed if it does not.

I do not expect this to come about at once, but I do expect people to get things started in that direction at once, and peg away with a clear idea in their own minds as to what they hope to attain. Hitherto, production has been going on in a very disjointed sort of a way. There has been a serious lack of general knowledge in many directions, and very considerable uncertainty as to results. All this we hope to see changed, and my mission in this district was to help to change it, by giving the necessary information in the various branches of work. What is needed is a clear idea of what is possible, and how it is possible, and then persistent work on the very best lines until we get there.

Several other parts of the country, more immediately around Rockhampton, present conditions very favourable for successful production. The most representative farming section is out at the Agricultural Reserve, a patch of very good "downs" country, some 12 or 14 miles from the city. Unfortunately, I only had one day's flying trip out there, and was unable to see anything like as much as I wished, but I am under engagement to go again and "do" the place thoroughly. I was very pleased indeed with the quality of the land so far as I looked at it, and I saw ample evidence that it can grow good crops. Crops for hay and chaff are the principal line so far as I could judge.

While talking about hay crops, I must mention one thing that struck me over and over again while travelling about the Central district.

The season had been a splendid one for growth right away out as far as the Peak Downs and Springsure. Through all the country near the coast the ticks had thinned out the cattle until in some places there were hardly any left at all.

Result : A wonderful growth of grass, and where the country was good, as much of it is, the grass was good too. I saw blue-grass country where one could have put in a mowing machine and cut away to further orders. I saw any amount of other valuable grasses which could have been served in the same way. And what an opportunity to save and store ! How many splendid haystacks might have been built this season in the Central district of feed which may possibly be wanted next year ; and yet almost the whole of it was left to be cut by the hard frosts and then burnt off. I wonder how many ages must elapse before our Queensland settlers learn the wisdom contained in the Old Testament story about Joseph and the years of plenty and the years of famine ! Or has the old Book got so much out of date now that people don't read it ? All the same, I think that story ought to be utilised by this Department in its instructions and advice to agriculturists.

It seemed an extraordinary thing to me that, with hay and chaff at starvation prices in the drought-stricken West, farmers in the more favoured parts could not see the value of this material. And, even apart from that, there is the danger in front of them of a drought coming in their own part of the district at any time, and I am of the firm opinion that, if a drought set in now, the great majority of the settlers in the very parts where this splendid growth has occurred would have starving stock in no time. Moral : Save when you can, and if you don't want it next year you will the year after that, perhaps ; certainly it will prove a blessed stand-by some day. My own idea is that a farmer ought to go on increasing his reserve of feed each year as much as he possibly can ; then, some day, he may have a surplus for sale at drought prices, and that is the time when the farmer makes money.

I remarked a while ago that the Central district is a big place. It is so ; and if people want to have this fact forced on their attention, they just want to get on the Western mail at Rockhampton and go West. My work took me not only through the coastal portions of the district, but west as far as Bardon. On the way, Emerald, Gindie and surrounding country, and Bogan-tungan and neighbourhood came in for a visit. Emerald is a busy point on the Western line, as it is the junction for both the Springsure and Clermont lines, and the traffic and trade of these two lines, added to the business of the main line running on to Longreach, make things fairly lively at times. Numbers of fat cattle and sheep trains are to be seen passing through *en route* for the coastal meatworks and butchering establishments ; while for some time before I left Rockhampton, and for some time since, a more extensive though much less satisfactory business has been done in the way of trucking hundreds of thousands of unfortunate sheep from the drought-stricken Western country to the Peak Downs district, where a good season had been experienced. A certain amount of fruitgrowing has been done about Emerald, with varying degrees of success. The dry climate is the great drawback, and an orchardist really wants a good water supply available to get the best results. Still, as much of the soil is of a sandy free nature, careful and deep cultivation will do wonders, and when the rain does come things grow in earnest.

The list of fruits suitable for the district is not a very exclusive one, though it comprises enough to keep a man busy ; for while the summer heat is great, and the weather often severely dry, the winter is much colder than many people would imagine. I saw some excellent oranges, and some splendid lemons of the Lisbon type, and in this latter line alone there is something well worthy of the careful attention of the growers as a most profitable crop. I also heard of first-class grapes being grown, but as it was the winter season I could only judge them by their growth. Not only here but at other places in the West the same matter came under my attention, and I am sure that in the near future our expert in that branch of work will find something satisfactory to deal with. I strongly advised growers to obtain his advice in connection with this work.

Fourteen miles out by the Springsure line is the Gindie State Farm, which I visited on duty for the first time. I need say nothing more now than that I shall be very much surprised if this farm does not make itself heard of shortly

to very good purpose, as a great deal of valuable work is being carried out there, and much more is in prospect.

The soil on much of this country is of the very highest quality, and I do not think I ever saw anything that pleased me more. The crops looked splendid, and the actual value of these crops, notably the wheat, will shortly be proved when harvesting commences. In the neighbourhood of Gindie there is a great deal of country that simply made my mouth water, to use a common expression: rich rolling country of vast extent, with soil of the best, and carrying feed of a quality and variety that is a revelation to anyone only accustomed to the commonplace stuff met with in some parts of the colony. Settlement has already commenced, and will go on, until some day, under proper methods of work, this place will, or ought to, put up a record that will be hard to beat. And surely right here will be seen and felt the enormous benefit of the careful experiment work carried out on the State farm. In their midst, as settlers increase in number, this work will be continually going on, and they will have the advantage of the advice, the example, and the experience of the officers who control and work the farm.

Out at Bogantungan I was delighted to find some of the finest fruit land I had seen anywhere; and not only can fruit be grown here of high quality, but in the rich pockets and flats along the creek many other farm crops can be produced in first-class fashion. Settlers here have a good time ahead of them if they will only work on the right lines. I cannot, however, hold these settlers at various places along the Western line altogether free from a certain amount of blame, for the simple reason that they do not take full advantage of their own market in the Western country. For instance, surely a settler has something good in front of him when such things as pumpkins and sweet potatoes are worth as much as £7 10s. per ton. This may seem a bit of a "stretch" to some of my readers, but I actually saw bags of these things which were sold at 7s. 6d. per cwt. When other things matched these in price, and when some lines could not be obtained without getting them all the way up from the coast, and the demand was strong in the West for good stuff under the sore pressure of the drought, I think there was good scope for the exercise of a little brains and energy, and a good prospect of very satisfactory returns. It is not enough to say your land can grow this or that to perfection; it is not enough to have a few fruit trees of one variety or another, and then say how much has been made off one tree or more; it is not enough for settlers to have their land available, yet still unproductive, while a market is begging to be supplied. A little pluck and go that will dare something in the way of comprehensive work, well carried out, is what is needed, and I am glad to know that my friends in these Western parts are now inclined to go ahead and try it. I don't think they will be disappointed either.

Now for Barcaldine—reached by a long run in the train through desert country, with its reddish sand, stunted-looking gidya scrub, and spinifex and turkey bush, presenting an appearance to the eye of the uninitiated and inexperienced traveller just about calculated to produce a fit of the "blues." A curious, dry-looking, thirsty, merciless sort of country to some folks; but to a man who knows a few things, very apt to start him thinking and wishing to try a thing or two. I don't profess to be a very wise individual, but I got thinking and speculating in my own mind as we went along through it, and I came to certain conclusions which I had a good opportunity to test later on, very much to my satisfaction.

The town of Barcaldine is built in the sand, and is surrounded by sand, although in certain directions one soon gets out on to fine plain country with strong soil. I found a good deal to do about the neighbourhood, and out as far as the labour settlement at the Alice; for although fruitgrowing has not been gone into to any great extent, a great number had been planting trees, and did not exactly know how to get on with them. Just about the town the sand is of a paler colour, and purer so to speak; and, curiously enough, water can be got at a few feet in limited quantities, while a little distance further out these conditions are entirely lost.

Of course, the great feature at Barcaldine is the bore water. Three or four bores are now in use, giving an ample supply to the townspeople and stock, and a very great blessing they must be to the place. Without such a water supply this particular country would, I should say, be a curious and rather undesirable place to live in at times; with the supply, the whole situation is completely altered. Not only is there an unlimited supply for ordinary household purposes, but one can keep the flower and vegetable gardens up to the mark without the least trouble. Things grow, too, in rare style in the apparently poor sand. As to actual results in fruitgrowing, I cannot say much as yet, simply because things are young; but this I can say: That right in the town I saw remarkably heavy crops of the best quality of lemons of the Lisbon type that I ever saw in my life. Some lines—peaches, for instance—don't appear to hold out long about the town, though outside, on somewhat different land, they may do better. Most of the citrus family promise well, also figs and persimmons. One gets a better idea of possibilities in fruit work by a visit to the Alice River Settlement. Here more pronounced work has been done, and things have reached a stage in their development where judgment may pretty safely be formed. This place consists of the real desert country, in some respects very different from the sand about the town. A fine bore is at work here giving an ample supply of water, and proving what a revolution is going to be worked in that part of the colony. I found that grapes had been grown extensively, and very profitably. Citrus fruits had done well, lemons especially; other lines of fruit also gave promise of good return, and general farm crops had proved well worth growing—all this, of course, with the aid of irrigation. What I saw at Emerald, at Bogantungan, and lastly at Barcaldine and the Alice, has pretty well convinced me that this part of the country has one great opportunity before it—that is in the working up of a good lemon trade.

If these parts of the district can go on producing on a large scale (and for the life of me I cannot see what is to stop them) such lemons as I actually saw and sampled, it will be the fault of the people themselves if they do not make a big thing of it.

Here we are importing pretty well all the year round both from the south and from the Mediterranean an enormous quantity of lemons, and paying very often top prices for them too, up to 24s. per case of 300 for Messinas; our people want them, and must have the supply; our coast country is incapable of growing a good lemon in large quantities, as they grow too rank. Out in the country I have been writing of, there are thousands of acres, which can produce quality equal to anything else in the world, waiting to be utilised; and why our own people should not rise to the occasion, I do not know. Another thing: The Western air is dry, and the climate is a most convenient one for "curing" lemons in the way that is needed for storage or long shipment. This process was touched upon by me in my work, and, should production increase to decent dimensions, actual demonstration will be given by officers of this Department amongst the growers. The benefit of such a method is that not only can the fruit be sent long distances, but it can also be stored, if necessary, to wait for such a time when the article is scarce and the price high. We ought to stop the importation, and we may possibly find something to do even beyond that.

Olives will very likely come in for considerable attention out there some day. There is any amount of room, and they will grow all right.

Wheat has already received some attention in the Barcaldine country, both on the plains and on the desert; and there is no question about it, if it proves a success, there is unlimited scope for the further exercise of both energy and capital. Take the plains for example, where one might pretty well start out after breakfast with one plough furrow, and come home in the afternoon with another, and never touch a bit of inferior soil the whole time. On the other hand, the desert country is available in hundreds of thousands of acres, but, of course, it has to be cleared of what scrub is on it—not a wonderfully difficult matter if one goes the right way about it. I may be pardoned if I mention here the names of the gentlemen who are doing laudable experimental work in the matter of wheatgrowing in this Western country.

Mr. Campbell is the pioneer in this work at Barcaldine, and he has a fair area planted on plain country, and irrigated by bore water. His wheat was very young when I saw it, and I shall be anxious to hear of the results obtained when harvesting is completed. This gentleman deserves every credit for his effort to prove the possibilities of wheatgrowing.

Mr. Peut has also made a commendable attempt, and deserves success. His wheat is also on plain country, and is irrigated by water from a fine bore.

Ten miles from Barcaldine, at Geera Geera, Mr. T. J. Hannay is also carrying out a most useful experiment with wheat on the desert country. He has a fair block cleared and planted with several varieties, all of which looked uncommonly well when I saw them. Irrigation is also carried on here by means of a splendid bore. Being on the sandy soil, this owner is able to irrigate by soakage from furrows opened at regular intervals, and the result is very satisfactory. Here, again, results after harvesting will be anxiously looked for.

As good evidence of what this desert country is capable of, I may state that Mr. Hannay has been most successful in raising first-class potatoes and a variety of other vegetables with the aid of his bore. A very ingenious contrivance was met with here in the shape of a large water-wheel erected over the bore, and into which the whole stream can be directed at will. The power so gained will work three or four different machines at the same time, and is a very great advantage to the owner. Once started, it keeps going on without any trouble.

Another owner, Mr. Cronin, is growing oatens hay extensively with the aid of bore water on sandy country.

Now I want to say a word or two about my own work amongst the people in these different parts. The reader must not imagine that all I had to do was to ramble about and look at the country. On the contrary, I had to carry out a certain line of duty for the Department, and I found plenty to do both of the theoretical and practical. Quite a number of lectures and addresses were delivered in various centres of population, accompanied by actual demonstrations in the various branches of work concerned, and followed up by visitation to many of the individual places in each part. The kindly attention paid to me in my work in all parts of the country visited gave me the greatest pleasure, and will not soon be forgotten by me. I found that growers everywhere had their share of enemies to contend with, both scale and insect pests being very plentiful; but I trust that, with the attention which is necessary, and the information given to work on, one marked result of the work will be a very considerable reduction of difficulties and an increase of successful production. Success will not come without effort and thoroughly systematic work. Not only must the best methods of cultivation be persistently followed up, but the capabilities of each district must be well understood, and in the case of fruit culture, for instance, only the best varieties of trees put in. It may be said that I have written a little too much on the bright side of things, but I don't think I have. Certainly I have not enumerated all the possible difficulties that may beset the fruitgrower or farmer, but then this is not the purpose of this article; matters of that sort were comprehensively dealt with by me in my work, as the people know amongst whom I travelled. What I have done is to present an idea of possibilities of production in some directions only, under what I consider to be the correct conditions of work and general treatment. Granted these conditions, I consider a fair measure of success may be looked for; and in the interests of the colony as a whole, I most cordially wish the best of success and prosperity to the Rockhampton and Central districts.

CORN-COBS AS A FOOD.

THE subject of ground corn-cobs as a food for stock has given rise to much controversy, especially amongst the farming community in the United States of America, some farmers asserting that once the grain is removed the cobs are of no value, whilst others quite as positively assert that they possess high nutritive

value. As there are many tons of cobs annually thrown away or used instead of firewood in this colony, it becomes a matter of very great importance to farmers to know whether they are thus destroying a valuable fodder material, or whether the cobs are, as has been supposed, absolutely useless as feed for stock.

To decide this question, the Department of Agriculture requested Mr. J. C. Brünnich, Chemist to the Department, to furnish an analysis of the corn-cob, and show its value and properties as a fodder.

Mr. Brünnich accordingly supplies the following information, from which it will be seen that, taking the comparative food values, commencing with corn as 100, of certain food materials, lucerne hay comes second and corn-cobs third on the list, corn-stalks fourth, and potatoes fifth:—

REPORT BY MR. J. C. BRÜNNICH, AGRICULTURAL CHEMIST, ON THE
VALUE OF CORN-COBS AS A FOOD.

Corn-cobs, as well as corn-stalks, have a considerable value as food, as shown by the following analysis:—

| | | | | Albuminoids. | Digest. Nutrients. | Fat. | Comparative value. |
|-----------------|------|-----|-----|--------------|---------------------------|-----------|--------------------|
| | | | | Per cent. | Carbo. hydr. Per cent. | Per cent. | |
| Corn-cobs ... | from | ... | ... | ·6 | 41·7 | ·2 | 37 |
| | to | ... | ... | 1·1 | 43·2 | ·4 | 49 |
| Corn-stalks ... | ... | ... | ... | 1·1 | 37·0 | ·3 | 36 |
| Corn ... | ... | ... | ... | 8·4 | 60·6 | 4·8 | 100 |
| Potatoes ... | ... | ... | ... | 2·0 | 21·8 | ·2 | 26 |
| Lucerne hay ... | ... | ... | ... | 9·4 | 28·3 | 1·0 | 65 |

Professor E. W. Stewart, in his "Feeding Animals," recommends strongly to pass the whole corn crop, stalks, ears, and all through a large cutter and reducing it to a fine chaff.

Corn-cobs may be ground by themselves to a fine bran-like mass, but the process is slow, and it is questionable if it would pay here.

EXHIBITS AT THE PASTORAL AND AGRICULTURAL SOCIETY'S SHOW AT BOWEN, NORTH QUEENSLAND.

THE Bowen Pastoral and Agricultural Society was established in 1879, and its annual shows have been fairly successful, with the exception of one or two, when bad seasons have been encountered. The last show—held on 17th August, when 30 gold and 42 silver medals valued at £60 and cash amounting to £20 were offered as prizes—was very successful, a good deal of credit being due to Messrs. Hildebrandt Bros., who took great interest in the competition, and were rewarded by securing 8 firsts and 1 second prize. Their farm and orchard is situated on the Don River, about 3 miles from town, where they have 45 acres under irrigation, and planted with 3,000 fruit trees, an increasing number of which are producing fruit each season. Their collection of fruit included 42 varieties, and in addition to farm produce they showed a collection of vegetables including cauliflowers over 50 inches in circumference.

TO REDEEM ALKALI SPOTS ON A FARM.

THERE are several ways in which it can be done if one is willing to make the expenditure of time and money. If water is available and an outlet for drainage can be secured, cut a ditch 3 or 4 feet deep from the centre of the spot to the point where the drainage water will escape. Put in drain tile, or, if these are not available, fill the bottom foot of the ditch with broken rock or cobbles, cover with brush or straw, and fill up the ditch with earth. Throw up a little levée a few inches high around the spot and fill with water. As

soon as this has soaked away fill up again, and keep doing this as long as your water or patience holds out. This will wash out the alkali, and if water is used freely upon the grass or whatever you plant on the spot there will probably be no more trouble from alkali. This is the surest way to cure an alkali spot. If water is not available and drainage too expensive, or otherwise not feasible, the next best treatment is the use of finely ground gypsum. In the presence of moisture this sulphate of lime changes partners with the carbonate of soda, and the result is carbonate of lime and sulphate of soda. The latter is white alkali, and is not so corrosive as the black, consequently more plants will grow in its presence. The amount of gypsum depends upon the amount of carbonate of soda. It is too expensive to reclaim bad black alkali in this way on a commercial scale, but the cost of curing an eyesore in a garden does not come under strict commercial calculations. The use of manure produces a good effect if worked into tough, black alkali soil, and if spread upon the surface, because it prevents surface evaporation and consequently checks the rise of the alkali and its condensation upon the surface. Such treatment is quite satisfactory after the alkali is washed down or treated with gypsum and trees or shrubs are planted. If the manure is used after washing out and deeply spaded in, and the surface sown with alfalfa, you will probably get a good stand, which will cover the ground and, by checking surface evaporation, prevent the subsequent rise of alkali. Some black alkali tracts have been reduced sufficiently for a stand of alfalfa by repeated flow of water over the surface and the descent of the water without drainage. This merely distributes the alkali through a thicker layer of soil, and makes it too weak at any point to do harm. The success of this plan depends upon a certain depth of soil and the absence of hardpan near the surface to prevent the downward course of the water. Ashes are of no use in alkali reclamation. The soil has too much alkali already, and the application of ashes simply means adding alkali.—*Pacific Rural Press.*

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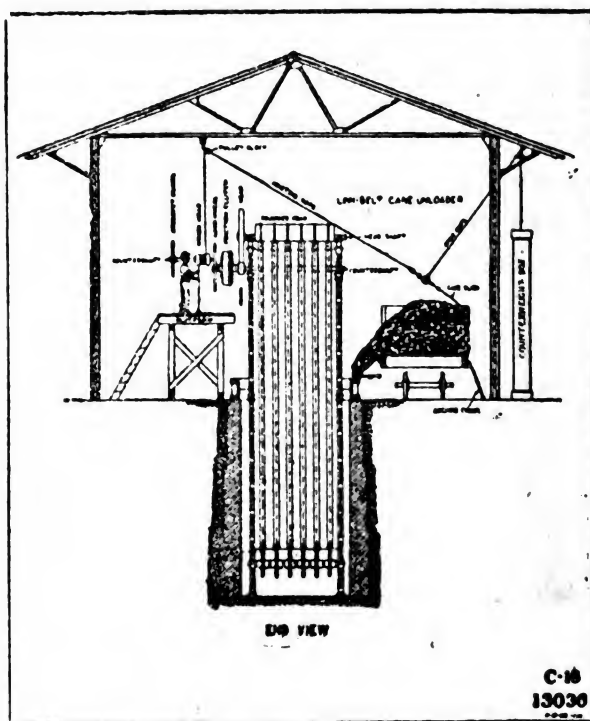
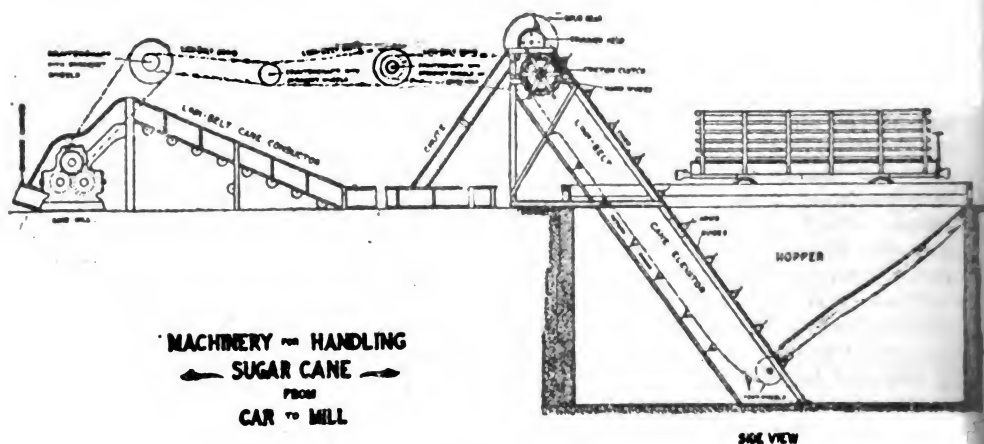
FARMERS should take notice that the sale of adulterated copper sulphate is becoming notorious. An article has lately been placed on the English market under the name of "Agricultural Sulphate of Copper," and the chemical section of the Royal Agricultural Society warns farmers not to be deceived by it. It has been analysed and found to contain 99·04 per cent. of sulphate of iron, and only 9·04 per cent. of sulphate of copper. The latter, if pure, should contain 98 per cent. crystallised sulphate of copper. This is worth 28s. per cwt., whilst sulphate of iron is only worth 4s. per cwt. in England.

THE LINK BELT CANE UNLOADER.

IN the economic handling of sugar-cane, Louisiana has led the world for years. Leading planters of other countries visit us to inspect on the spot our labour-saving devices and methods, and such machinery built or developed in Louisiana can now be found in every cane-sugar country in the world. In Louisiana the well-known Link-Belt Machinery Company has devoted itself for years to the improvement and development of sugar machinery, and they are now offering their latest link-belt cane unloader, which they illustrate and describe as follows:—

The link-belt cane unloading machine, illustrated herewith, is a new device, designed for the rapid and economical unloading of cane from railway cars and carts to the cane conductor. It is not new in the sense that it has never been tried, because this machine has been in successful operation in Cuba for the past two years, during which time all defects that have appeared in the machinery and construction have been carefully noted and corrected. The load

in the car is divided into two or three sections, according to the size of the car, and is discharged from the car to the pit in the manner shown in the illustration. Only one attendant is required at the winch-head, the use of which permits the unloading to be started and stopped instantly or carried on as slowly or as rapidly as may be desired. The cane from the pit is carried up in a slow moving continuous mass, and delivered over the head of the incline to the cane conductor much more evenly than it is possible to place it by hand, thus insuring an even regular feed to the mill. The cane from the carts can be unloaded by the same means, or the carts can be backed up to the other side of the pit and unloaded by hand.



The plan shown in the illustration is subject to such modifications as may be necessary to meet different conditions. Where it is inconvenient to take power to drive from the mill roll, a small vertical engine, geared direct to the head of the inclined carrier, is used. Instead of discharging the cane from the cars in the manner shown in the illustration, it has been found desirable in some cases to elevate the load vertically from the cars by means of an overhead carriage, and deliver the entire load directly into the pit. This change can be effected by a slight modification of the construction without any alteration being required to the machinery or to the cars already existing on the estate.

In the conduct of a modern sugar estate, the saving of labour is an important feature, especially in the West Indies, where labour, at the present time, is most difficult to obtain. In the sugar business, as in other lines, profitable results are now only obtained by conducting the operation on a large scale, and this is evidenced by the abandonment of the small plants and the extension in size and capacity of the large estates, on which 500 tons of cane and upwards are ground daily. This quantity of material cannot be unloaded economically by hand in the old way, as the large number of labourers required and the time lost by the loaded cars and carts waiting around on the bately, to take their turn in this tedious process of unloading, makes the cost excessive. This machine provides a thoroughly reliable, efficient, and economical method of unloading cane from cars and carts, so that they can be promptly returned to the field, and it has fully met these requirements in the two years of actual service.

It has been demonstrated that this machine saves the services of 16 men, and does the work usually performed by this labour in a much more satisfactory manner. The economy offered by the use of this machine during one crop more than pays for the entire investment required, besides performing the work with much more efficiency and facility. On a new estate this machine does away with the necessity for the long-cane conductor, which has always proved a source of expense and annoyance by reason of the power required to operate and the costly delays occasioned by frequent breakdowns.

One of these machines is now being shipped to the Molokai Sugar Estate, of the American Sugar Company, where the cane from the cars and carts is discharged directly into the pit and delivered by the cane-unloading machine directly to the borro of the mill. Four more are now being built for use on estates in Cuba and Santo Domingo. The construction throughout is made exceedingly strong and rugged to meet the heavy service required. The supporting framework can be made of timber or steel, as may be desired.—
Louisiana Planter.

THE PRINCIPLES OF SHEEP-BREEDING.

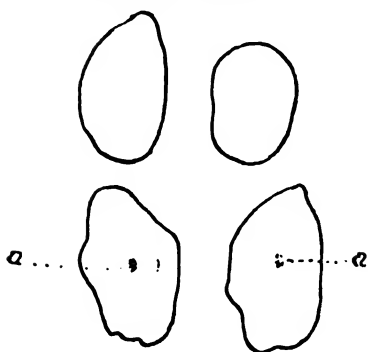
No. 5.

By J. S. HERMANN SCHMIDT.

THE WOOL HAIR OR WOOL FIBRE.

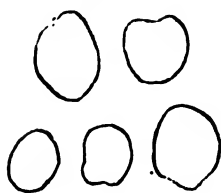
THE whole mass of the wool fibres as they grow on the sheep's back presents itself in the shape of a large number of bunches, which are smaller or larger in size according to the qualities of the single fibres of which these bunches are composed. These natural congregations of wool hairs are called staples. The external appearance, the shape, and the size of the staples are sure tests of the qualities of the fibres of which they are composed, and a sheep-breeder will be able to form a pretty correct idea about many of the qualities of the wool from the form of the staples alone, if he knows through what qualities of the single fibres certain formations of the whole staple will be effected. An experienced sheepclasser can frequently tell nearly all the qualities of the wool by looking at the formation of the staples. In the meantime we must remember that the quality and the quantity of the yolk, the condition of the sheep on

LEICESTER YEARLING.



a Slight indication of Medullary Channel.

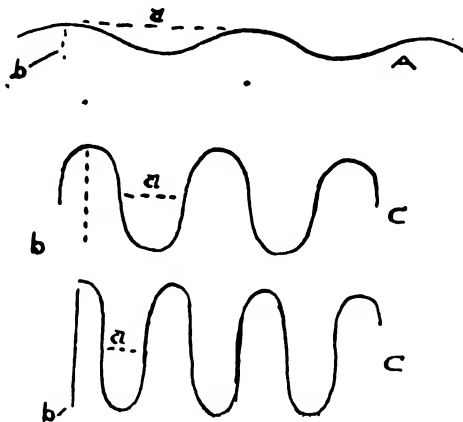
FINE SAXON WOOL



Exhibiting no Medullary Channel

which the wool is grown, as well as the climate and the season, greatly modify the appearance of a fleece. A much closer examination of the fleece is necessary in Australia—at least, in the North-western parts of Queensland—than it is in Europe. Our sheep produce very little yolk, and the dry seasons, as well as the influence of the tropical sun, obliterate many outer indications which are available in Europe. A person who professes to be able to class sheep systematically by merely allowing them to pass through a lane cannot perform good work. In order to become fully acquainted with the good or bad qualities of the wool, we must look at it in the shape of (1) the single fibre, (2) as the staple, (3) as the fleece in its entirety.

The qualities of the wool fibre, to which we shall devote special attention, are its form, fineness, waving, trueness, length, soundness, elasticity, felting property, softness, lustre, &c. If we stretch a single fibre until its waving has entirely disappeared, it is not unlike a piece of fine wire or a cylinder of a diameter more or less equal in its whole length. The wool fibres of lambs are pointed at the top; they increase in diameter up to a certain place and become then thinner, so that the whole shaft has the look of a spear. After the thickened and pointed end has been cut off once, the wool fibre will always exhibit a blunt top whenever it is clipped. A new, pointed top, however, is visible in the new fleece which the skin produces after the former one has been lost through illness or starvation. The several kinds of wool materially differ with reference to their diameter; that means if slices of the shaft were cut off horizontally we should notice different shapes.



We notice that the wool of wild animals—such as the hair—and uncultivated wools show great irregularity in their diametrical formation, and that the wool of highbred merinos approaches the circular form. It stands to reason that a thread, made of equally fine and perfectly cylindric wool fibres, must be more even than a thread made of flat, quadangular, and irregularly shaped fibres.

Fineness.—In common life we employ the term “fine” to signify an article of beauty or value, and in this meaning of the word a fine bit of wool does not always signify fibres of a fine diameter. In speaking of wool, however, we shall use the term “fineness” exclusively to express a small diameter.

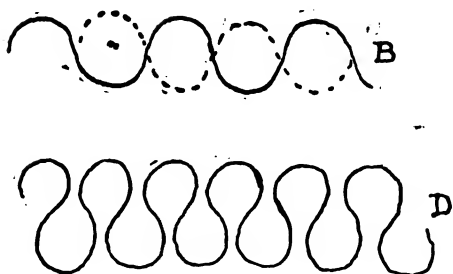
As it requires a very accurate eye to make fine distinctions as to the fineness of different samples of wool—an efficiency which can only be acquired by a great deal of practice—several instruments were invented to test the fineness of single wool hairs, for the purpose of fixing a standard of measurement. It would lead us too far away from the practical object of these lines if I were to give a minute description of the various more or less ingenious contrivances applied for measuring the degree of fineness of a sample of wool. The best results, however, can only be obtained by the use of a microscope and its micrometer.

The degree of fineness of a wool does not play so important a part in the value of it at present as it used to do in former times, yet it is still a quality much appreciated by the manufacturer. For this reason we must not lose sight of it. Really fine wools do even now fetch high prices.

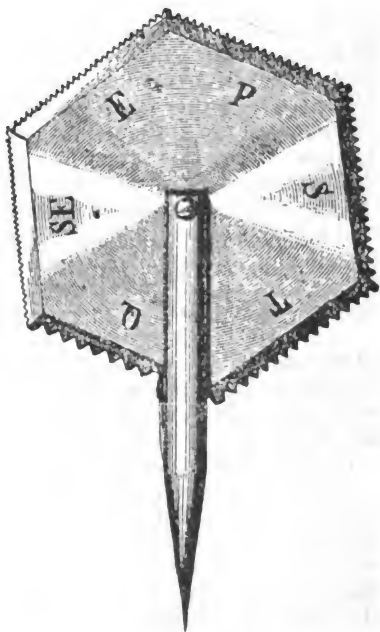
Taking fineness as the base for valuation and for determining the assortment of wool, the woollen manufacturers have fixed a certain standard for assortments, which, however, do not coincide quite with each other, owing to different weights and measures employed, although the principle employed is the same. Those nations who have adopted the metric system indicate the fineness of the wool by the number of metres that can be spun out of one kilogram of perfectly clean wool, ready for spinning. In England the standard is fixed by the number of yards that can be spun out of 1 lb. of wool. To determine the degree of fineness of a sample or a fleece of wool, we must trust to the naked eye. This will do for all practical purposes, and every person with anything like an accurate sight will soon be able to make all practically necessary distinctions.

In order to judge the fineness—*i.e.*, the proper assortment to which a fleece belongs—we have to take several other points conjointly into consideration; for instance, the waving, the division of the sample into finer skeins, &c. Fineness may be judged with some accuracy by placing several samples together on a piece of dark cloth (sleeve, hat), &c. Fine wool, to be valuable, must be in perfectly healthy condition. Wool that is fine in consequence of sickness or starvation is not valuable, owing to want of strength and elasticity. Fine wools are generally short. The finest Silesian wools of former years did not surpass 1 inch in natural length of staple. Lately, however, these fine wools have much improved in length. Both in Germany and in Australia I have seen exceedingly fine wools that were fully 2 inches long—a proof that even fine wools may be grown into good length by careful breeding in a suitable climate and in favourable localities.

Waving.—The wool of most cultivated sheep has an undulated or wavy appearance, because each fibre is bent into more or less regular half-circular curves. This waving must not be confounded with the curly, or rather spiral, formation of some kinds of the hair of the human head, the latter having the form of a screw. The French call those curly, spirally formed staples *tire-bouchons* (corkscrews). We may easily form a screw by winding a piece of wire round a pencil moving from one end to the other. This is not the normal growth in wool. The waving of the wool proceeds in a straight, not spiral direction. These waves form one of the most important points in valuable wool. In a wave we distinguish its length and height, and we observe four different formations:—1. The length of the wave is greater than its height, so that the wool has a straight, sleek character, desirable for all kinds of wool that have to undergo the process of combing. 2. Length and height are equal. In



this case the wave assumes a regular half-circular form, which is most desirable for clothing wool, yet still adapted for the comb. 3. The wave is higher than long, and it appears now remarkably clear and distinct. Such wools are also valuable to the cloth-maker, yet not so desirable for plain goods. 4. The waves overlap each other; they are not unlike the loops in a piece of cotton obtained by unravelling a sock, or similar articles produced by knitting. Wool fibres so constructed are highly objectionable, because they cannot be properly disentangled by the carding machine, unless to the detriment of the latter. These loops are caught in the fine carding hooks instead of passing through, and by so doing break or strain them. These loopy fibres have also a tendency to grow spirally, through which their objectionable nature is still more increased. It is evident that all wools of half-circular waving are best adapted for any kind of manufacture. This half-circular formation facilitates a mutual interlinking and a close growth of all the fibres, and it is mostly combined with other desirable qualities. A regular clear wave is a great desideratum in good wool. In the shorter *bonâ fide* clothing wools, a rather high, clear, wave is more desirable than a slight wave. In combing wools, the less pronounced, more sleek waving is preferable. At the same time some of the most highly priced combings have also a very clear wave.



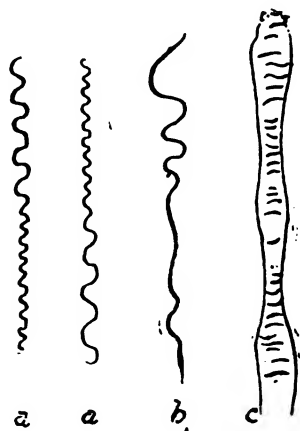
The length of the wave is generally in proportion to the diameter of the fibre. We therefore recognise the degree of fineness in a wool sample by the size or the fineness of the wave. The waves of some wools are smaller than a pin's-head, and those of the Leicesters and Cotswolds are bigger than a pea. The number of the waves on the space of 1 inch furnishes a pretty reliable test of the fineness of the sample. The assortment of extra super, for instance, has 28 to 32 waves on the space of 1 inch. The assortment super, 24 to 28; prime, 22 to 24; seconds, 18 to 20 (of the German inch), which is very nearly of the same length as the English inch. Block manufactured an instrument by which the number of waves in the space of 1 inch can easily be ascertained. The instrument consists of an hexagonal piece of tin, each side of which is exactly 1 inch long, and which contains a number of serrations corresponding to the number of waves of each assortment to the space of 1 inch.

By placing the sample to be tested for its fineness against any side of the hexagon and trying to which side of it the waves of the sample fit nearest, the degree of fineness can easily be ascertained.

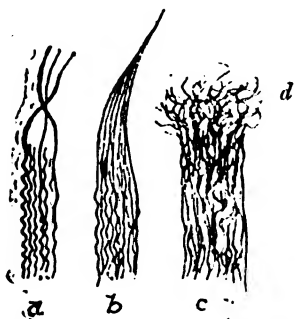
Similar instruments have been constructed by Pabst and Hartmann.

By the use of any of these instruments a beginner will soon be able to distinguish between the various degrees of fineness by which the assortment is determined.

Trueness.—It is easily understood that the number of waves to be counted on the length of 1 inch chiefly depends upon the diameter of the fibre; therefore, the difference in the size of the waves on the same wool fibre prove that where the waves are larger the fibre must be thicker; where the waves are of the same size, the diameter or, in other words, the fineness of the fibre is the same throughout. Such fibres are called "true"; where, on the contrary, some parts of the fibre exhibit larger or differently shaped waves, we say the fibre is "untrue." I have very frequently observed this untrueness in ill-bred flocks. We must distinguish, however, between apparent and real untrueness. Let us suppose the sheep had been well fed, and had been in good health up to a certain time, and had, later on, suffered from starvation, caused through want of water or scarcity of food. In such case the waves in the upper part of the staple will be larger than in the lower part, and *vice versa*. (a) In this case the difference in the fineness of the fibre has been caused through irregularity in the nutrition of the fibre. This would be a case of apparent untrueness, such as will disappear so soon as the animals are well fed. Real untrueness (b) shows itself in the form of an entirely irregular wave, or in the disappearance of waving altogether in one part of the fibre. I have examined great many specimens of this kind of fibre. Viewed under the microscope, untrue fibres show the irregularity of their diameter much more clearly. (c) Real untrueness is not easily accounted for. It is only found amongst crossbred or illbred



animals; and it may occur owing to great dissimilarity in the organisation of the skin, where the conflicting elements of different ancestors have exercised an effect on the skin and its products. Untrueness is easier observed in the look of the whole staple than on the single fibre—a matter to which I shall refer again; and sometimes we observe the longer and coarser hairs raise themselves beyond the top of the staple, and appear there like points or a peculiar fluffy overgrowth.



- a. A speary staple analysed.
 b. A speary staple in its natural form.
 c. Overgrown wire staple.
 d. Untrue hairs raised above the level of staple.

We thus distinguish the untrueness of the single fibre and the untrueness of the whole staple. To this I shall refer more particularly later on. Untrue fibres are objectionable, because they cannot be used for thoroughly even and high-class yarns. They are also liable to break when combed, yielding a number of short, broken bits, called "noil." They are likewise indications to the breeder that there are certain undesirable elements present which militate against successful improvements.

Length.—By the length of a staple of wool we mean the height to which it has raised itself from the skin during one year's growth. This is also called the "height" of the staple. The true length of the wool fibre will be found after drawing it out until all the waves have been stretched, to make the fibre look straight.

Of two staples, having the same height, the one with the higher more marked wave will give the longest fibre when stretched out until the waves have disappeared. Thus the true length of a wool fibre cannot be estimated unless by the method of stretching and measuring. This cannot be done in practice; therefore, in speaking of the length of a staple we mean the linear dimension from the skin to the top of the staple of a year's growth. We now call wools shorter than 2 inches "short or clothing wools," and those exceeding that length "long or combing wools." This distinction, however, is not made so strictly now, as it was done formerly. I have already mentioned that all kinds of sheep wool continue to grow without interruption so long as the animals are in a healthy state and in good condition. The experiments which have been made in order to find out how long a fleece will grow without interruption have proved that the length of the wool decreases every year if the fleece is not periodically shorn. A staple which grew in the first year 2 inches will add in the second year $1\frac{1}{2}$ inches to its length only; in the third, $1\frac{1}{2}$ inches; fleeces, on the contrary, which are shorn regularly every year, will, under ordinary circumstances, produce almost the same length yearly.

It has also been noticed that the wool grows more quickly immediately after shearing. Professor Rhode, of Eldena, made a number of interesting experiments in order to find out whether the length of the wool fibre is materially influenced through feeding. The results have shown that the length increases in proportion to the amount of nourishment consumed, or rather digested, in

excess of the ordinary demand; a result amply verified through the great increase of length of staple in paddock-fed sheep in comparison to those that were shepherded.

Soundness.—Youatt says: “A wool fibre is sound when its substance is healthy throughout, and does not show any breaches or withered parts.” A sound fibre has a certain degree of strength, so that it can withstand a comparatively strong pull without breaking. Any sound and true fibre may be pulled out of its natural curve until it looks perfectly straight, and the degree of its strength may then be ascertained by observing how much farther the same fibre may be extended without breaking. A fibre may be perfectly sound and healthy, and yet have no strength. This can only be accounted for by a peculiar condition of the individual animal. There are frequently to be met with such wools, though cut from perfectly strong and healthy animals, that have not the strength that could naturally be expected. This admits of no explanation, and it shows us that strength of fibre is a quality that must be bred for, and that must be systematically developed by careful selection. We may call this the “specific strength” of the substance of the wool fibre, which is in no way related to the diameter of it. For instance, a steel wire equal in thickness to one of copper is much stronger than the latter, and it is this specific strength to which the breeder has to pay attention.

Strength is indispensable to all kinds of wool that have to undergo the process of combing. Ill-fed combing wools without strength are next to useless for that purpose. The value of clothing wools is not so much lessened if slightly wanting in strength, provided they are good in other respects. As long as a staple composed of a few fibres gives a clear sound, if pulled like the string of a musical instrument, we may pronounce it as strong enough for most purposes. The strength of the substance of the wool fibre differs almost as much as that of steel, iron, and other metals. Wool has also a limited amount of ductility.

Elasticity.—In common life we call “elastic” every substance which, having been expanded or compressed, bent or stretched, tends to resume its former state and position—for instance, watch-springs, indiarubber, feathers, &c. Elasticity is one of the most necessary qualities of any wool, not only because elasticity is a symptom of a healthy condition, but much more, as without it no yarns could be spun fine and strong in the meantime. Elasticity may be seen in different ways—(1) By pulling a staple out of its waving and letting it go again; (2) by bending a staple; and (3) by compressing a quantity of wool. The quickness and energy by which the wool resumes its waved form, its upright direction, and its natural volume are signs of its elasticity. Elasticity alone, however, does not fully answer the purposes of the spinner unless it be of a gentle nature. The spinner values a wool far higher if its elasticity is of a pliable, supple nature, as it will then allow itself to be easily twisted and pulled without suddenly going back into its former position. Perault de Temps distinguishes three kinds of elasticity—*l'élasticité du frisé*, *l'élasticité du retirement*, and *l'élasticité du redressement ou du volume*. The first kind of elasticity shows itself if we take a single fibre and pull it out of its waving until it breaks. The broken parts of the fibre should then quickly resume their original waved appearance. The second kind will be observed if a small staple, upon being pulled out, returns at once to its former length; and the third kind by taking a handful of wool, pressing it tightly together, and opening the hand suddenly. The wool of great elasticity rises up at once into its former volume. That gentle, supple, and at the same time energetic elasticity which we observe in all wellbred and well-nourished wools is entirely wanting in wools taken from dead sheep.

I believe that the several phenomena of elasticity are owing to a peculiar nature of the cortical substance, and are chiefly the result of breeding. Feeding has far less to do with it. I have handled fleeces from healthy and well-fed sheep, grown on the richest country, and found them entirely void of elasticity; and I have observed others, not very well fed, grown on poor mountainous

country, that exhibited in a remarkable degree that mild and gentle elasticity so desirable to the spinner. The first-mentioned class had the blood of English sheep in their veins; they descended from some crossbred South Australian rams, and run on a Darling Downs station. The last-mentioned ones had descended from Glengallen rams (first importation), and lived in the Burnett district—country where wool of the highest quality may easily be grown, provided the sheep are kept away from unsound portions of the district. I merely mention this to show that we must not rely too much upon our superior country and climatic influences; but that elasticity as well as many other desirable qualities are chiefly to be obtained through careful breeding.

The Felting Property.—Felting property is that peculiarity of many kinds of hair or wool which shows itself in the great tendency of those horny products to entangle themselves easily with each other into such disorderly position that they cannot be taken out of it again unless by means of force, and not without partly being destroyed; for instance, the felt of hats, the felt cloaks of the Russian soldiers, the felt tents of the Khirgiz and Calmucks, which are manufactured out of very short hairs. Any kind of hair or wool may be put into this disorderly combination by means of repeated pressure being employed, such as beating with sticks, walking on it or pressing it between rollers, &c. The process of felting is considerably assisted through the application of heat, moisture, and chemicals such as soap, fuller's earth, &c. A felt is, therefore, a close dense combination of many kinds of hairs or wool by means of their being thoroughly entangled within each other, or by being placed in all directions. Youatt and others have tried to find out why it is possible to felt animal hair and not vegetable fibres. The reason seems to be that vegetable fibres are mostly wanting in elasticity. Youatt believes to have found the reason of it in "the serrated or feathered edge of the wool fibre," and he tries to prove that the phenomenon of felting is almost exclusively to be accounted for by that. I have already pointed out Youatt's error; and by proving "that the wool and other kinds of animal hair that felt comparatively easily have no serrated or feathered edge, but that their surface is, to all practical purposes, exquisitely smooth," Youatt's theory would be at once refuted. The question, however, is, of so much interest to the woolgrower that I shall devote a little more attention to it.

The first point in Youatt's theory—namely, that the surface of the wool has a feathered and serrated edge—is founded on error. The edges of the epidermal scales protrude very slightly; if they did, the bulk of the wool fibres would feel very rough, and the roughest wools would felt easiest. This is quite a mistake; the smoothest and silkiest wools felt easiest. Youatt further remarks that a staple of wool does not felt if left in its natural position; that it is necessary to break the staple into half, and unite the two halves again in an inverted position, so that the edges of the serrations should be placed face to face. This, again, is incorrect, and anyone can easily convince himself that a natural wool staple will be changed into a solid cord of felt without interfering in the least with the parallel position of the fibres. In order to understand the nature of the felting property thoroughly, we must not overlook that the smoothest of hairs are liable to be felted. Horses will frequently turn their tails into solid masses of felt by repeatedly beating them against their bodies. I have examined many tails of horses brought in from wild mobs, and have noticed that in almost every case. The peculiar malady of the human hair, called *Plica polonica*, which occurs not unfrequently in the district adjacent to the Vistula, is another instance of an almost spontaneous felting process of perfectly smooth hairs. Then, again, we have the fact that a number of short and smooth hairs, such as the hair of horses, cattle, and camels, may be turned into most perfect felts. All these instances disprove the theory of felting as originating from a serrated edge.

It must be admitted that a number of fibres with a smooth surface will move alongside each other much more easily than those with a serrated edge, particularly if these are placed opposite each other. The easy way in which string, twine, or the smooth human hair are entangled will serve as a proof of it.

If a lot of twine were covered with stiff bristles, let them be ever so short, it would not entangle so readily. That such bristly string, if once entangled, would be more difficult to disentangle again is quite likely, but we have not to deal with that. We require to entangle the wool fibres thoroughly and quickly in the first instance; and for that purpose the single fibres must run smoothly along each other, so as to get thoroughly interlooped.

Professor Beaumont, of the Leeds College, in referring to the serrations or, properly speaking, the fine edges of the cuticle scales covering the wool hair, says: "Saxon wool—possibly the finest, softest, silkiest, and in many particulars one of the best wools grown, and moreover a wool of acknowledged superior milling power—contains not less than from 2,700 to 2,800 serrations (*i.e.*, cuticle scales) in 1 inch. Australian, another excellent clothing wool of good milling property, contains 2,400, while Leicester wool, of comparatively inferior felting quality, only contains 1,800 serrations, in 1 inch of fibre." Generally, it will be found that the felting property is the highest in wools containing the largest number of imbrications, but there are exceptional fibres. Cape wool, for example, although fine in hair and full of serrations, is not a good milling wool. According to the microscope, its fibres possess all the characteristics of a wool of excellent felting powers, whereas, practically, it is regarded as only a secondary wool in this respect. Port Philip and Buenos Ayres wools might be instanced as two other fibres which would, if the milling characteristics depended entirely on the multiplicity of serrations in a given length of fibre, be similar to each other in this particular. But, instead of this being the case, they are almost as different in felting power as it is possible for the produce of the same genus of animals to be. Port Philip is almost without parallel in the point of fulling property, while the defectiveness of Buenos Ayres in this essential may be said to be proverbial. If the "serrated edge" entirely fails to be the means of good felting in some instances, that property cannot be ascribed to it.

For these and other reasons I think we must look for the causes of the felting property elsewhere. So much is certain: That a strongly pronounced serration must militate against smoothness—a quality which is, particularly with regard to combing wools, even more desirable than the felting property. Smoothness and felting, however, are quite compatible with each other, as is shown in the finest Saxon, Silesian and Australian wools. If we were to sacrifice smoothness in order to obtain a more serrated edge, and by so doing obtain greater felting property, we should do a very foolish thing.

The phenomenon of felting might reasonably be accounted for through the following circumstances: 1. The extremely hygroscopic nature of the wool fibre—*i.e.*, its readiness to absorb and to part with moisture. 2. To the elastic nature of the cortical substance, and its inclination to assume a waved form. 3. The smoothness of different kinds of hair, especially of the wool fibre.

The conditions of good felting property are dormant in the substance of the cortical substance. They are a matter of individuality, and must be bred for.

Even the most elastic wools will readily lose all their springiness if brought into contact with hot water. Having thus become extremely pliable, any mechanical action will soon entangle them very intimately with each other, particularly if the free motion of them is facilitated through the addition of a slippery material like soap, which in the meantime tends to dissolve and remove any particles of the yolk that might be in the way. We thus deprive the wool of its elasticity in the first instance, so as to allow a complete entanglement. After these now unelastic, pliable, slippery hairs have thoroughly entangled themselves, let the mass be dried; the natural elasticity will then return, and you will have before you a close, dense combination of hairs, which are placed in such a disorderly position that they cannot be taken out of it again unless by means of force, calculated to break or otherwise destroy them, and this is the definition I gave of the term "felt." All that the breeder has to look for is a combination of great elasticity with pliability and smoothness of surface, which will guarantee all the felting property which a valuable wool is expected to show.

Softness is that smoothness of the surface of the wool which can be felt by the touch of the finger, and will be found in wools of a perfectly smooth surface only. We have shown in a former chapter that the wool fibre is clothed with a layer of fine leaves—the cuticle; and a fibre will feel the smoothest, the more tender and thin the substance of these leaves is, and the closer they surround the pile. Manufacturers value that softness highest which appears to be equal, whether the fingers remove from the root towards the top of the staple or in an opposite direction, against the points of the epidermal leaves. Thus it follows that a fibre will be softer the less any of the scales of the cuticle stick out, and the less there is an indication of anything like a serrated edge. Youatt says:—“Softness of the pile is evidently connected with the presence and the quantity of the yolk. There is no doubt that this substance is designed not so much to nourish the hair but to give it richness and pliability.” We have proved, however, that the yolk does not influence the quality of the wool fibre itself, although it serves to protect it to a certain degree against atmospheric moisture. It is also a well-known fact that the softest wools in the world, such as the best Victorian—to wit, Ereildoun and the French Mauchamps—and other lustrous wools have the least yolk of any, and that there exist many rough, coarse, half-bred wools which abound in grease. Softness is fine organisation of the cuticle of the wool fibre, and it is essentially connected with the organisation of the skin. It corresponds with a general fineness of the texture throughout the body; it is very little influenced by the yolk, and, like elasticity and other valuable qualities of the wool, is a matter of individuality, and must be bred for.

Lustre means that peculiar power of reflecting the light which we observe so strongly developed in silk, and which does not always show itself in its true nature until the wool is washed. There are plenty of wools, certainly, that exhibit as much lustre in the grease as after they are washed; others again appear very lustrous as long as they are surrounded by an oily yolk, which, having been washed out, leaves a fibre of a comparatively dull appearance. The bright and valuable lustre of the wool depends very much upon the nature of the fibre itself. I have seen washed wools that resembled more the threads of spun glass—the fibres seemed to be almost transparent. I have seen others of an intense whiteness. The difference between the latter and the former reminded one of the difference between china and glass. A really white fibre with a true lustrous surface will show the dye to the best advantage. If such wools are dyed properly they will look as if the artificial dye was their natural colour, and it is hardly worth mentioning here that deviation in colour from the pure white is objectionable.

WHEATGROWING IN SOUTH AUSTRALIA.

THE *Adelaide Observer* of 10th June contains the following very interesting and instructive article on the evolution of agricultural machinery, and its influence on wheat production:—

THE INFLUENCE OF MACHINERY ON THE COST OF WHEAT PRODUCTION.

In the struggle for existence, whether animal or vegetable, political or commercial, that quality which may be designated as adaptability to changing circumstance is one of prime importance. It was this characteristic in the pioneers of South Australia which made it possible for agriculture to be carried on successfully in conditions remarkably out of joint with those left behind in the old country. The more strongly new arrivals were imbued with the conviction that English practice represented the *no plus ultra* of scientific agriculture, the more tardy were they in turning their backs upon it and beginning *de novo*. Happier were they who had nothing to unlearn. Ignorance was bliss as compared with the painful process of idol-shattering.

PIONEER DIFFICULTIES.

It is impossible to realise the exact degree of topsyturvydom which South Australian conditions presented to those who had come fresh from the classic seat of agricultural achievement—Great Britain. There, Nature was coaxed by the application of manures, rotation cropping; labour was plentiful and cheap; and the market certain and fairly remunerative. Here the soil had only to be tickled with a hoe and it gave forth an abundant harvest; but labour was so scarce that many found it impossible to thoroughly gather their crops; and even when the grain was recovered, markets and prices were exasperatingly uncertain. The climax was reached in the harvest of 1842. In 1838 a crop of wheat from about 20 acres was gathered. This was grown within the city. In the following year about 120 acres was cropped, and yielded 25 bushels to the acre. In 1840 the area was 1,059 acres; in 1841, 4,154 acres; and in 1842, 14,000 acres. The harvesting of the latter was a serious problem, seeing that it had to be done by primitive methods, and there was but a handful of people available. To augment the available supply of men, the soldiers stationed here were required to lay down their swords and take up sickles. The increased demand for harvesters sent up the wages to 15s. and 20s. per acre for reaping alone; and as 1s. per bushel was paid for threshing, the harvesting charges totalled £2 per acre for a 20-bushel crop.

In his "Early Experiences of Life in South Australia," the late Mr. F. W. Bull describes his troubles in connection with his 1842 harvest:—"My crop was in condition for hand-reaping before the end of December, but I could not procure reapers before the 24th, as men had been earning large wages on the plains. On that day I was able to induce five men to accompany me, and I conveyed them to the farm. I did not allow them to work on Christmas Day, but they had Christmas fare. I engaged to give them 15s. and one bottle of rum an acre, with rations. The crop was dead ripe, the heads drooping with the weight of the plump grain. On the 25th a fiery hot wind was blowing, and continued on the following day, when I expected the reapers to start work. But they were missing. I found them at the nearest grog-shop. After some trouble I got them away to start work on the following morning. Before a sickle was put into the crop, the loss in shed wheat was over a bushel to the acre, and a further loss necessarily followed in harvesting." Mr. Bull goes on to detail how, in carting his wheat to Adelaide, one bullock, for which he gave £20, was killed; and when the grain found a buyer he received 4s. a bushel for some, and 3s. 6d. for the remainder.

THE GENESIS OF THE STRIPPER.

The position at this stage is well described by the late Mr. Francis Dutton, in his "South Australia and its Mines," written in 1846. He said:—"The farmers all knew that the land would grow corn in abundance; but they put in their grain with fear and trembling, not knowing but that, when the crops were ripe, the half of them might be shed before they could get sufficient hands to reap them." How this difficulty was overcome by the invention of the stripper—how the cost of harvesting was reduced to about one-eighth of its previous sum—are matters of recorded, if forgotten, history. Certainly, no invention or adaptation in connection with our agricultural machinery has produced anything like such wholesale beneficent results, or has had such an important bearing upon production, as did this snatching of the stripper from the silver sea of thought! Rarely, if ever, has the truth of the philosophic phrase, "Necessity, the mother of invention," been more completely exemplified. It will not be out of place here to briefly refer to the birth and infancy of this labour-saving machine. According to Mr. Bull, a sort of club had been formed of town gentlemen, who, with farmers, used to dine together at Payne's Hotel, afterwards known as the Exchange Hotel, Hindley street, and here discussions on agricultural subjects were introduced. Out of this gathering a committee was formed, called the "Corn Exchange Committee." The necessity of some contrivance to aid producers in harvesting having

been made so apparent, this committee took the matter up with zeal, and announced through the medium of *The Register* that they would be prepared to give a reward for the best invention to be exhibited to the committee, and advertised for the first meeting to be held in September, 1843, so as to allow time for the construction of machines before the approaching harvest. No fewer than thirteen persons exhibited models and drawings of various machines, but the committee came to the conclusion that there was none which they were justified in recommending for general adoption. One of the models shown proposed to cut the wheat-heads off, and this was exhibited by Mr. J. W. Bull. In the meantime Mr. John Ridley, a miller of Hindmarsh, who did not compete, built a working machine, also on the principle of stripping the heads off the straw. He acknowledged his indebtedness for the idea to an article in an encyclopædia, in which was the cut of a machine used in ancient days on the plains of Gaul. This was a complete success at once. The machine was propelled by a pole from behind, the pole being supported on two small wheels. Two horses did the work. Mr. Ridley presented the invention to the public, and got no profit out of it except a margin on the actual machines which he made and sold. The colonists, however, were not behindhand in acknowledging Mr. Ridley's valuable service, and a fund was promoted by Captain Bagot. The sum raised was presented to the inventor at the Agricultural Society's meeting in 1845, by His Excellency the Governor, the late Sir George Grey. Mr. Ridley, with his usual liberal spirit, applied the sum to the extension of his library by the purchase of the best scientific works, the use of which he allowed to industrious and deserving mechanics. In March, 1853, the inventor, with his wife and two daughters, returned to England. Before his departure he was presented with complimentary addresses by the Adelaide Corporation and the Agricultural and Horticultural Society. He died in 1887. It should be noted that in acknowledgment of the services rendered by Mr. Bull, who claimed to be the inventor, the South Australian Parliament voted him £250 in 1882.

Concerning the first machine made by Mr. Ridley, the late Mr. Dutton wrote:—"One afternoon during the summer of 1843-44 some friends met me in Adelaide and asked me to join them in their ride to a neighbouring farm, where Mr. Ridley's reaping machine, which they said both reaped and threshed the corn at the same time, was successfully at work. It was not generally known at that time what the machine was, and, although we were all incredulous, we started to see with our own eyes how far the reports we had heard were correct. Presently we saw from several quarters other horsemen, all steering to the same point. By the time we reached the farm a large field had mustered to witness the proceedings; and there, sure enough, was the machine at work by the agency of two horses and two men—one to guide the horses, the other the machine. There was no mistake about it. The heads of the corn were threshed off perfectly clean; and a winnowing machine being at hand, the corn was transferred out of the reaping into the latter machine, and carts were ready to convey the cleaned grain to the mill, two miles off, where the wheat, which an hour before was waving in the fields in the lustre of golden tints, was by Mr. Ridley's steam-mill ground into flour. Never before was perhaps such a revolution in the appliances of agriculture caused as was done by this machine. Success attended the very first trial of it, and during seven days it reaped and threshed the 70 acres of which the paddock we all went to see was composed."

Captain Bagot was one of the first who used this implement, and a letter from his pen, published in January, 1845, is particularly interesting, especially as bearing on the cost of production. It ran thus:—

"To the Editors of *The Register*.—Gentlemen—The following is a statement of the work performed by one of Mr. Ridley's locomotive threshing machines on my farm at Koonunga:—On the 26th December we entered into a field of 39½ acres of wheat—a good full crop, tolerably thick, and about 4 feet high. In nine days it was all threshed, the machine having been at work 6 hours

The threshed corn was laid down in heaps in the field, and winnowed there. The result has been 843 bushels of well-cleaned corn ready for the market. The machine was drawn by six bullocks. The expenses incurred were—

| | £ | s. | d. |
|--|-----|----|-----|
| Two men with the machine, one to steer and the other to drive, 9 days at 2s. 6d. each... | ... | 2 | 5 0 |
| Use of the machine at 2s. 6d. per acre ... | ... | 5 | 0 0 |
| Cost of stripping 843 bushels... | ... | £7 | 5 0 |
| (or little more than 2d. per bushel) | | | |

Three men were employed for 12 days winnowing and carting in the corn to the store—

| | £ | s. | d. |
|---|-----|----|------|
| Three men, 12 days, each at 2s. 6d. ... | ... | 4 | 10 0 |
| Use of winnowing machine... ... | ... | 1 | 0 0 |
| Cost of winnowing | ... | £5 | 10 0 |

Less than 1½d. per bushel, making the entire cost of harvesting and preparing for market 3½d. per bushel. I am aware that much greater quantities of work have been done by some of these machines. I was not obliged to hurry, and preferred allowing ample time. We seldom put it to work before 11 a.m., as we found at an earlier hour the straw was tough and the threshing was not so perfect as at a later period of the day. The result, however, is most satisfactory, and proves the extraordinary value of Mr. Ridley's admirable invention. I consider the machine most perfect as calculated by Mr. R. to be worked by a pair of horses. The application of ox-power to it will perhaps require some trifling modifications to render it equally perfect for them. With the aid of this machine, wheat may be grown in this colony for about 1s. 6d. per bushel, as shown in the following statements:—

| | £ | s. | d. |
|---|-----|----|------|
| Rent of 80 acres of enclosed land at 4s. per acre ... | ... | 16 | 0 0 |
| Ploughing 40 acres at 7s. per acre ... | ... | 14 | 0 0 |
| Seed for 40 acres, 60 bushels at 1s. 6d. ... | ... | 4 | 10 0 |
| Sowing and harrowing at 1s. 6d. per acre ... | ... | 3 | 0 0 |
| | £37 | 10 | 0 |

The other 40 acres to lie fallow.

| | | | |
|--|-----|----|-------|
| Produce of 40 acres at 20 bushels per acre, 800 bushels, into £37 10s. ... | ... | 0 | 0 11½ |
| Cost of harvesting ... | ... | 0 | 0 3½ |
| Carting ... | ... | 0 | 0 3 |
| Cost per bushel ... | ... | £0 | 1 6 |

And by this mode of alternate cropping and fallowing the land will continue its productiveness for an indefinite period. Trusting that this plain statement of facts may be interesting to some of your readers, I shall be happy to see it admitted to a place in your paper.—I am, gentlemen, your obedient servant,

“C. H. BAGOT.”

The gallant captain and sturdy old pioneer, however, grievously offended the other farmers in South Australia by stating that wheat could be grown in the colony for 1s. 6d. per bushel, and 2s. 6d. was put down as nearer the mark for the whole colony. The point is an important one, and I shall again refer to the question of the cost of production as it now appeals to producers.

One of the strippers made by Mr. Ridley was in use at Gawler River on the farm of the late Mr. John Dawkins for many years. Mr. Dawkins, the late Mr. John Wilkinson, of Gawler, and the late Mr. John Dunn, of Mount Barker, were all employees of Mr. Ridley, and assisted to build the first stripper.

The Gawler River machine was propelled from behind by bullocks for some years, but after some experiments the steering gear was altered to a chain contrivance, similar to the steering gear on vessels. Finally the rack and worm were adopted. The wheels of this machine are now in the possession of Messrs. Martin and Co., having been presented to the Gawler firm by Mr. S. L. Dawkins, the son of Mr. John Dawkins, and son-in-law of Mr. John Wilkinson. The wheels are 3 feet 6 inches high, and made of iron, with cast-iron naves, the spokes being screwed into the naves, and fixed up with lead run into the joints. The near wheel was fixed on the axle, and the driving power applied to the off side. Now the near-side wheel is used for this purpose.

IMPROVEMENTS TO THE STRIPPER.

But efficient as was the machine made by Mr. Ridley, the stripper of to-day is a vastly improved implement. In cost, efficiency, and draught those of the best South Australian makers at the present time are a great advance upon the pioneer of the forties. To go no further back than the fifties. The Hon. James Martin got £150 for the first reaping machine he made; to-day the modern article is obtainable for less than £50! In construction, weight has disappeared at no cost of strength, and the draught is estimated to be at least one-third less. Then, too, in completeness of threshing, avoidance of loss, and adaptability to varying conditions of weather, the latest product of the mechanical skill is a triumph compared to its prototype.

It was not long before the principle of propulsion from behind had to give place to the side application of the power. The late Mr. Adamson was the first to adopt this, and it was at once recognised as an improvement. Then came the invention of the thimble comb by Messrs. Martin and Co., of Gawler. This obviated the loss of grain, which was inevitable with the flat-toothed comb previously in use. The benefit of this invention was a gift to the public, as Messrs. Martin and Co. decided not to protect themselves by patent. Not long after this the farmers, led by the Hon. James Martin—himself a farmer as well as a manufacturer—dispensed with the extra man, and made one hand do the work of driving and steering. The reduction of the draught and the advance to greater simplicity made this substantial saving of labour possible. Of late years the most useful improvement has been the damp-weather gear. This permits reaping to be done much more expeditiously, and the machine probably saves its total cost in a year or two in the prevention of loss by storms, &c., and through the wheat remaining unreaped. There have been numerous improvements in details. One of these is the adoption of self-adjusting bearers for the beaters. As showing the natural conservatism of farmers in these matters, the first season this improvement was introduced by the late Mr. Fred. May into Martin and Co.'s machines every farmer but one, an Irishman, preferred the old style. Now the use of these bearings is universal! The superiority of the South Australian machine over those of the other colonies is admitted, and several hundreds are exported to the sister provinces every season. The original stripper was an inspiration; the machine of to-day is a revelation! The pioneer reaper was a rough diamond; the modern article a polished gem! It has enabled the farmer to live during the present cycle of low prices, where otherwise he would have starved.

THE PLOUGH.

Although the plough is not a South Australian invention, South Australia can claim to have greatly improved and adapted it to local requirements. At the outset of farming in this colony, wooden ploughs were the popular implement, and wooden ploughs and harrows were amongst the first implements made by the Hon. James Martin when he started at Gawler. They were soon superseded by iron, and at first English manufacturers did a considerable trade in them. Later, the colonial article established a strong footing, and is now highly popular. The prejudice which at first existed against the use of iron ploughs is illustrated by the story which is told about the Duke

of Richmond, when he presented two of the new implements to a farmers' association in one of the English counties. After the expiration of one year, the plough was returned to the duke with the message—"We be all o' the same opinion that it do make the weeds to grow!" What these good husbandmen would have said if they had seen a South Australian stump-jumper capering about in the most approved style over mallee stumps, stones, and other obstructions, it is not easy to imagine. The stump-jump plough has this colony as its birthplace, and so popular has it become that few others are now used. There is more than one claimant for the honour of having introduced this exceedingly useful invention. It is contended on behalf of Mr. R. B. Smith, of Kalkabury, that his plough, "The Vixen," made in June, 1876, was the pioneer. He registered his invention on 19th February, 1877. This secured him for twelve months, but, on account of the difficulties and expense attending the taking out of patents under the old Act, he did not apply for one. Mr. J. W. Stott, formerly of Alma, claims to have made the first practicable stump-jump plough, and has supplied a large number of these implements to farmers. Mr. Shapland is another who has urged his right to be considered the inventor of the principle. Messrs. Martin and Co., of Gawler, assert that they were the first to put the idea into practical form, and that they did so at the instance of Mr. Mullen, of Wasleys, the father of the process of scrub clearing known as "mullenizing." No matter to whom the idea originally occurred, or whether it occurred to two or more at the same time, the stump-jump plough has, next to that of the stripper, been the most valuable invention in connection with the development of our agricultural industry. It is a coincidence that neither of these were patented, and that the public received the benefit of them without any deduction for royalties. Mr. R. B. Smith worked very hard at his idea, and it was unfortunate for him that his implement did not immediately achieve the success it subsequently obtained, as he would have then been encouraged to take advantage of the full protection of the Patent Act. In a letter he wrote later, he remarked somewhat pathetically:—"My invention has cost me some money, some anxiety, and condemned my little ones to all the miseries of poverty and banishment in the bush, whereas if I had been a successful cricketer, a good bowler, or a rifle shooter without pluck, a Blondin, or an acrobat, I and mine would have escaped these ills." However, in 1882 Parliament provided some solatium for Mr. Smith in granting him a vote of £500. Perhaps no one has done more than Mr. C. H. Smith, of Ardrossan, to improve the stump-jumper, and make it the popular implement it is to-day; and his new six-furrow stump-jumping plough is a marvel of ingenuity and good workmanship. Messrs. R. B. and C. H. Smith were working together in 1876, and it was from the interchange of ideas between the two brothers that the first stump-jumper is said to have originated. Certain it is that Mr. C. H. Smith is entitled to much credit for the present position which this implement occupies. The day of the single-furrow plough is past, and even two-furrow implements are now few and far between. The multiple plough, of light construction up to five, six, and even seven furrows, is becoming extremely popular, and promises to displace in part, at least, the scarifier. On this point Professor Lowrie observed in his last annual report:—"Our leading farmers are satisfied that they get a better seed bed by the use of the multiple plough in place of the scarifier. On lands where the dandelion or Cape weed is plentiful, it will be found far superior to the scarifier as a means of cleaning the fallows in autumn, and, indeed, wherever there is a growth of vegetation fairly established, and especially in damp weather, the scarifier is not in it with the multiple plough." The improvements which South Australian manufacturers have effected in the plough, and its kindred cultivators, the scarifier and harrows, must have cheapened the cost of cultivation very considerably. The introduction of the seedsower, which has displaced the old laborious process of hand-seeding, has also saved valuable time, and secured greater efficiency. Messrs. May Brothers and Co. and other makers have introduced improvements which render it a more desirable implement than the American article.

THE WINNOWER.

The winnower is another machine which has been greatly improved by manufacturers of this colony. Messrs. Bagshaw and Sons have made the perfection of this implement a specialty, and if those who bore the burden and heat of a day at the crude machine of 40 years ago could have suddenly had dropped into their midst the Bagshaw of 1898 they would have thought they were sweetly dreaming.

Professor Lowrie has frequently acknowledged the indebtedness of agriculturists to the skill, enterprise, and ingenuity of South Australian manufacturers. They have, as he says, "nobly risen to the occasion," and the exceptionally low cost of wheat production must be credited in large measure to their efforts.

MISCELLANEOUS.

The evolution of the machinery of the hayfield has also been remarkable. Less than 30 years ago the scythe was the weapon of offence in the hayfield, but soon after that the mowing machine—an invention of a Scotch divine—revolutionised hay-making, and now the binder has caused another revolution. The binder may to some extent supplant the stripper, but the latter will probably retain its supremacy over the greater part of South Australia.

The drill is another importation which is calculated to have an important bearing in improving our farm practice and increasing its profitableness.

INFLUENCE ON THE COST OF PRODUCTION.

To return now to the important subject of what it costs to grow a bushel of wheat. To get an approximate estimate of the value of our improved machinery in reducing the expenses of production, it is necessary to go back to the pioneer days. Let us consider the cost of cultivation and of harvesting alone. A prominent farmer of this colony was paid in the early days £1 an acre for harvesting with a sickle, and 1s. a bushel for threshing with a flail—equal to £2 an acre for a 20-bushel crop. Taking the figures of Captain Bagot as a basis, the cost, minus rent, taxes, and seed, in 1842 works out thus:—

| | | | | | | | | |
|----------------------------------|-----|-----|-----|-----|-----|-----|----|----|
| Ploughing and sowing, per bushel | ... | ... | ... | ... | ... | ... | s. | d. |
| Harvesting | ... | ... | ... | ... | ... | ... | 0 | 5 |
| | | | | | | | 2 | 0 |
| | | | | | | | 2 | 5 |

In 1843, with the Ridley reaper, the cost figured out as follows:—

| | | | | | | | | |
|----------------------|-----|-----|-----|-----|-----|-----|----|----|
| Ploughing and sowing | ... | ... | ... | ... | ... | ... | s. | d. |
| Harvesting | ... | ... | ... | ... | ... | ... | 0 | 5 |
| | | | | | | | 0 | 3½ |
| | | | | | | | 0 | 8½ |

Thus through the invention of the stripper the cost of the mechanical operations of the farm were reduced at once from 2s. 5d. per bushel to 8½d.: or from £2 8s. 6d. per acre to 14s. 4d.

How will the same items in the present cost of production come out? It must be borne in mind that the forties were the years of virgin land, and 20 bushels to the acre with little cultivation was looked upon as quite the correct thing. To-day land has to be worked twice or three times for one crop! And then without the aid of manures a return of 20 bushels is a bold, if not unwarranted, expectation.

About six years ago Mr. Peter Roach, of Kadina, published some interesting statistics concerning the cultivation of 1,000 acres of land by himself. The particulars were in detail, and bore the impress of undoubted authenticity. The mechanical operations of his farm cost him as follows:—

| | | | | | | | | |
|---------------------|-----|-----|-----|-----|-----|-----|----|-----|
| Ploughing, per acre | ... | ... | ... | ... | ... | ... | s. | d. |
| Sowing | ... | ... | ... | ... | ... | ... | 2 | 3½ |
| Harrowing | ... | ... | ... | ... | ... | ... | 0 | 2 |
| Reaping... | ... | ... | ... | ... | ... | ... | 0 | 7½ |
| Winnowing | ... | ... | ... | ... | ... | ... | 1 | 5½ |
| | | | | | | | 0 | 5 |
| Cost per acre | ... | ... | ... | ... | ... | ... | 4 | 11½ |

This was admitted to be below the cost of the average farm in South Australia, and I have been favoured with the estimate of a well-known farming authority in the lower North, where holdings are smaller, and the very best practice is necessary to secure good yields. It is thus:—

| | s. | d. |
|---|----|----|
| Cultivation, including ploughing, scarifying, harrowing, providing for fallow | 8 | 3 |
| Sowing | 0 | 10 |
| Reaping (say 12 bushels) | 3 | 4 |
| Winnowing | 1 | 3 |
| Total per acre... .. | 13 | 8 |

Or 1s. 13d. per bushel. This may be taken as a fair estimate of the purely mechanical operations of the farm in those districts where temporary soil exhaustion was a few years ago plainly indicated. For the colony as a whole, it may be doubted whether the average cost per acre would reach 8s. Rent, seed, marketing, and taxation are purposely omitted from the calculation.

A comparison on the same lines with English and American practice would be interesting, but the necessary data are not available. Here are some figures, however, which represent the average cost of large growers of wheat in England in 1890, omitting manure:—

| | £ | s. | d. |
|---|----|----|----|
| Cultivation and seed | 1 | 19 | 1 |
| Harvesting, threshing, and marketing | 1 | 4 | 1 |
| Rent, tithes, rates, and taxes | 1 | 8 | 5 |
| Cost per acre | £4 | 11 | 7 |

A glance only is necessary to see that not only the mechanical operations of the English farm but the total cost of production are greatly in advance of the South Australian at per acre, though the larger yield in the old country would diminish the difference at per bushel.

The total cost of wheat production in Argentina in 1893 was estimated at £1 12s. 6d. per acre, and the average was barely 10½ bushels per acre.

CONCLUSION.

It is undeniable that the extraordinarily low cost of wheat production in South Australia is largely due to the original invention of the stripper, and to the continual improvements that have been made in that machine and other farm implements. That finality has been reached is highly improbable. Our manufacturers are always keen for improvement. Their working creed seems to be the sentiment which the immortal Tennyson expressed—

Let the great world spin for ever
Down the ringing groove of change.

Anyhow, when posterity doffs its hat and bows its head in homage to the dead pioneer agriculturist, the dead pioneer manufacturer will also be worthy of reverent remembrance.

IRRIGATION BY ARTESIAN WATER.

The first instance in Queensland of grazing farms being irrigated by artesian water from a bore put down by the Government on land subsequently thrown open to selection is near Cunnamulla, on the Warrego. From the last Annual Report of the Department of Public Lands we learn that a considerable time ago it was decided to try the experiment of opening to selection in a suitable locality some grazing selections to be watered by an artesian bore previously put down on the land at the expense of the Government. Inspections and surveys were directed to be made by experienced officers in certain localities, some of which it appeared might be utilised for the purpose. The object was to

ascertain if the surface of the ground in any of these localities was of such a nature as would permit artesian water from a suitably situated central bore, or bores, to flow by gravitation to surrounding grazing farms, and if any particular site was specially advantageous.

The result of such inspections and surveys was that a site was selected as supplying the necessary conditions on Bando Resumption, about 35 miles northerly from Cunnamulla, and about 21 miles westerly from Coongoola Railway Station, Warrego district. Trial surveys and levels were then taken to ascertain the area that would probably be watered from the proposed site of the bore, after which eight farms, varying in size from 16,000 acres to 20,000 acres each, comprising a total area of 145,800 acres, were surveyed round the site. After this was done the contract was let for putting down the bore, which was finally completed and handed over to the Department by the Hydraulic Department in April, 1898, the continuous flow from the bore being then 2,100,440 gallons during each 24 hours, the temperature of the water 130 degrees Fahrenheit, and the total depth of the bore 2,090 feet. The water, after analysis, was found of exceptional purity, and fit for use in any manner, even for human consumption.

Further surveys were then made and levels taken in order to ascertain the exact positions for channels proposed to be constructed to convey the bore water to each farm. After this had been ascertained, and plans, specifications, &c., prepared, tenders were called in the beginning of the year for the necessary work. This work was completed some little time ago, and the eight farms were thrown open to selection on the 3rd October last, it being intended that seven of the farms, comprising a total area of 125,800 acres, shall be watered from the bore, it being doubtful in the case of the remaining farm if the water will reach it. The rents have been fixed very moderately, ranging from 1½d. to 2½d. per acre, which includes everything. The maximum area for selection is 20,000 acres, and terms of leases of the farms 28 years each.

Since the above was written, we learn that one of the farms having an area of 17,800 acres has been selected at a rental of 2d. per acre per annum.

The contract price for putting down bores in the Warrego district is £1 per foot up to 2,000 feet, including casing; and selectors, who wish for a bore but are unable to pay cash, can, in most cases, make satisfactory financial arrangements with the boring company, and, after supplying their own grazing farms with water, frequently supply one or two or even three of their neighbours with bore water. The usual charge for supplying a 20,000-acre grazing farm with bore water is about £50 per annum, or ½d. per acre, according to circumstances.

During the year 1898 several more bores have been put down.

NUT-GRASS (*CYPERUS ROTUNDUS*).

By PHILIP MAC MAHON,
Curator, Botanic Gardens, Brisbane.

LAST December a gentleman engaged in horticultural work in a neighbouring town visited the Botanic Gardens. This is the time of year when, as is well known, nut-grass is at its best—or worst. As a result of his visit he wrote this letter: "Dear Sir,—In walking through your Gardens the other day I was surprised to see so little nut-grass, as I recollect the place much overrun with it. Kindly let me know how you keep it down, and how I can get rid of a large patch of it? Would salt kill it? I am told buffalo-grass would smother it, but in a garden the remedy would be worse than the disease, I fear. I have dug and ploughed up the plot, and am now picking it out by hand, but it is slow and costly work."

At the Agricultural Conference recently held in Mackay, the subject of the eradication of nut-grass was one of those discussed, and the number of persons from very different localities who gave their experiences in the matter

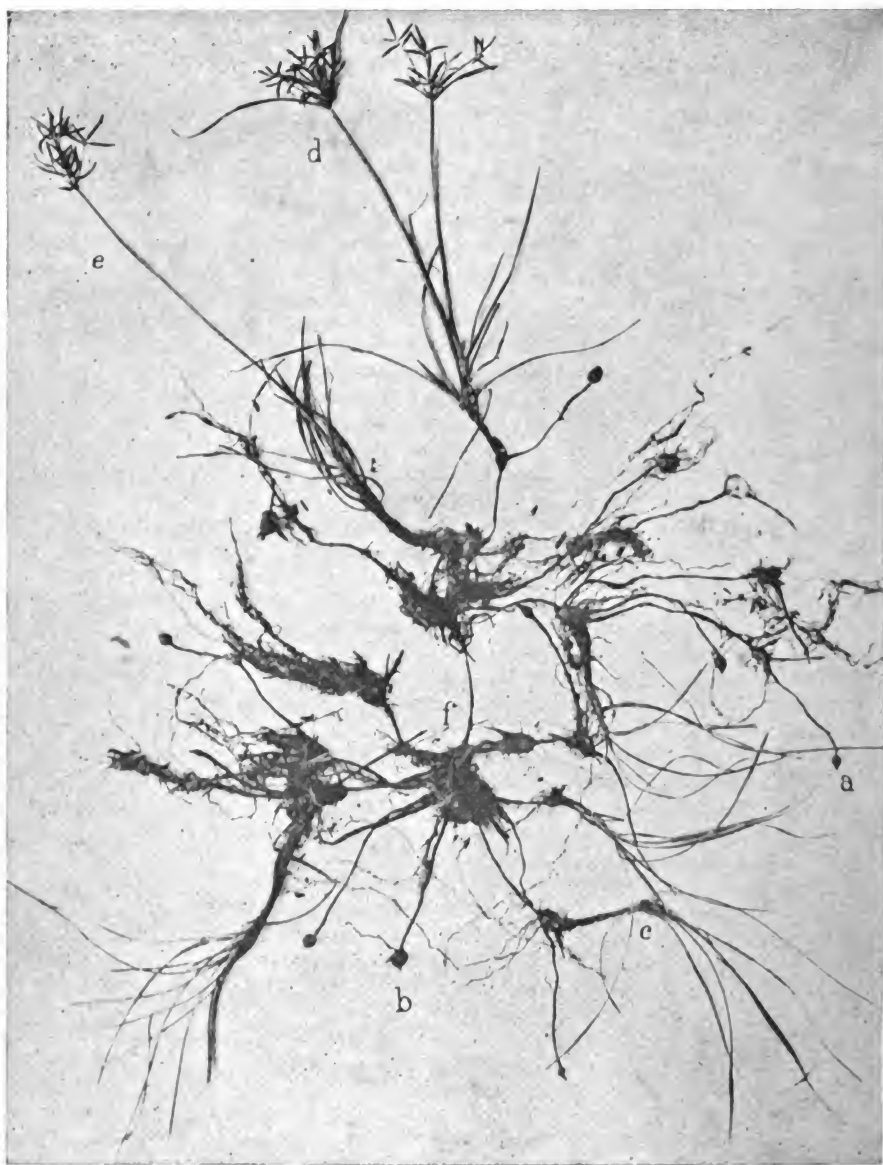


Plate I.

NUT-GRASS (*Cyperus rotundus*, Linn.), REDUCED ONE-THIRD.

shows the wide distribution of the plant and the interest taken in the subject of its control. Mr. W. Gibson, of Bundaberg, who has had to fight it in sugar land, recommended the use of the Planet Junior cultivator, and it was stated that molasses spread over the land eradicated it. Other gentlemen spoke of it as a green manure when ploughed in, and as an ingredient in cow-feed. The system, so often recommended, of making enclosures on the land affected and allowing pigs to run in them, was also advocated. Some advised frequent ploughing. It was stated that nut-grass was well known to some of the speakers in the Brisbane district thirty-five years ago.

When one takes seriously in hand to conquer an enemy, the first thing is to become acquainted with that enemy's tactics, and so we will consider for a moment what nut-grass is, how it behaves itself, and what are the particular qualities which render it so objectionable to the horticulturist and farmer. As regards our knowledge of it in the first instance, it was well known to and employed by the ancients. Homer mentions it, and in his day it was used as a component of horse-feed. In the famous description of the sanguinary fight in the bed of the River Scamander it is mentioned, and is wrongly translated "the cypress rising in a spire" by Pope. Chapman more correctly translates it "Galingale," as does Way (1888). Herodotus says that the Scythians used it for the purpose of embalming. Pliny and several other ancient writers refer to it in various ways.

It is well known throughout India, the South of Europe, and almost all Australia, having well-recognised names in the native dialects, according to Mr. Maiden, who has written a most useful and interesting paper on the subject. It is an extremely troublesome weed in the Southern States of North America, and is also reported to be a pest of cultivation in the West Indies.

In India it is held in great repute amongst native practitioners, and the writer can vouch for its efficacy in a severe attack of dyspepsia succeeding dysentery. If you scrape one of the tubers you will find that the flesh underneath is white inclining to yellow. If you slowly chew this you will find that the taste is a most peculiar one, not remarkably unpleasant, and it is a little curious that after a time one gets to quite like the taste. It produces usually a somewhat peculiar sensation on the back part of the palate, as though through the liberation of a volatile oil. There is a sensation in the taste of very dilute turpentine, which, however, it is difficult to exactly describe. The nut is said by native doctors in Bengal to have a most stimulating effect upon the mucous membrane, and to be so mild in its action that it can be safely recommended to persons suffering from acute forms of stomach disorders. It is also claimed that it has a marked effect in producing insensible perspiration. In the manufacture of scent the tubers are largely used in Bengal.

Botanically, nut-grass is not really a grass, but a sedge. You can always tell a grass from a sedge by the fact that in the sedge the stalk is not jointed as in the grass, and is usually three-cornered, while in the grass it is round. The two illustrations will give a good idea of the general appearance of the plant. In Plate I. is shown a mass of the tubers all joined up together by long filaments. During the winter months the tubers lie dormant, and in the spring from these dormant tubers (so-called nuts) long white filamentous shoots are sent out. These shoots are true underground stems, and are furnished with sheathing leaf-like scales. The shoots vary in length. In soft rich ground they are 5 or 6 inches long, and in hard, compact, and poor soil much shorter. Indeed, the behaviour of the whole plant varies so much in cultivated and uncultivated ground that it almost seems to be a distinct species, were it not for the fact that the small variety of uncultivated land at once becomes robust when changed to worked soil. When the shoot has proceeded a little way from the parent tubers, always in a horizontal and never in a vertical direction, except under circumstances to be presently mentioned, a thickening takes place near the end of the growing shoot. This thickening is white and pear-shaped. The small end grows on and begins to turn up to the light; and from the thicker end or base, a crown of delicate white roots is sent out. These spread into the surrounding earth, and begin to forage for sustenance for the coming

plant. Then the growing point peeps up into daylight, and begins to do its share towards that end. The swelling increases, begins to turn brown, and forms the tuber or nut; the roots, too, get stronger, and turn brown; the scales of the growing shoot, which were arrested in their development when underground, now assert themselves, and come forth as grass-like leaves up to 9 or 10 inches long, of a dark-green colour, and having a keel-shaped midrib down the centre. The leaves are generally about a dozen in number.

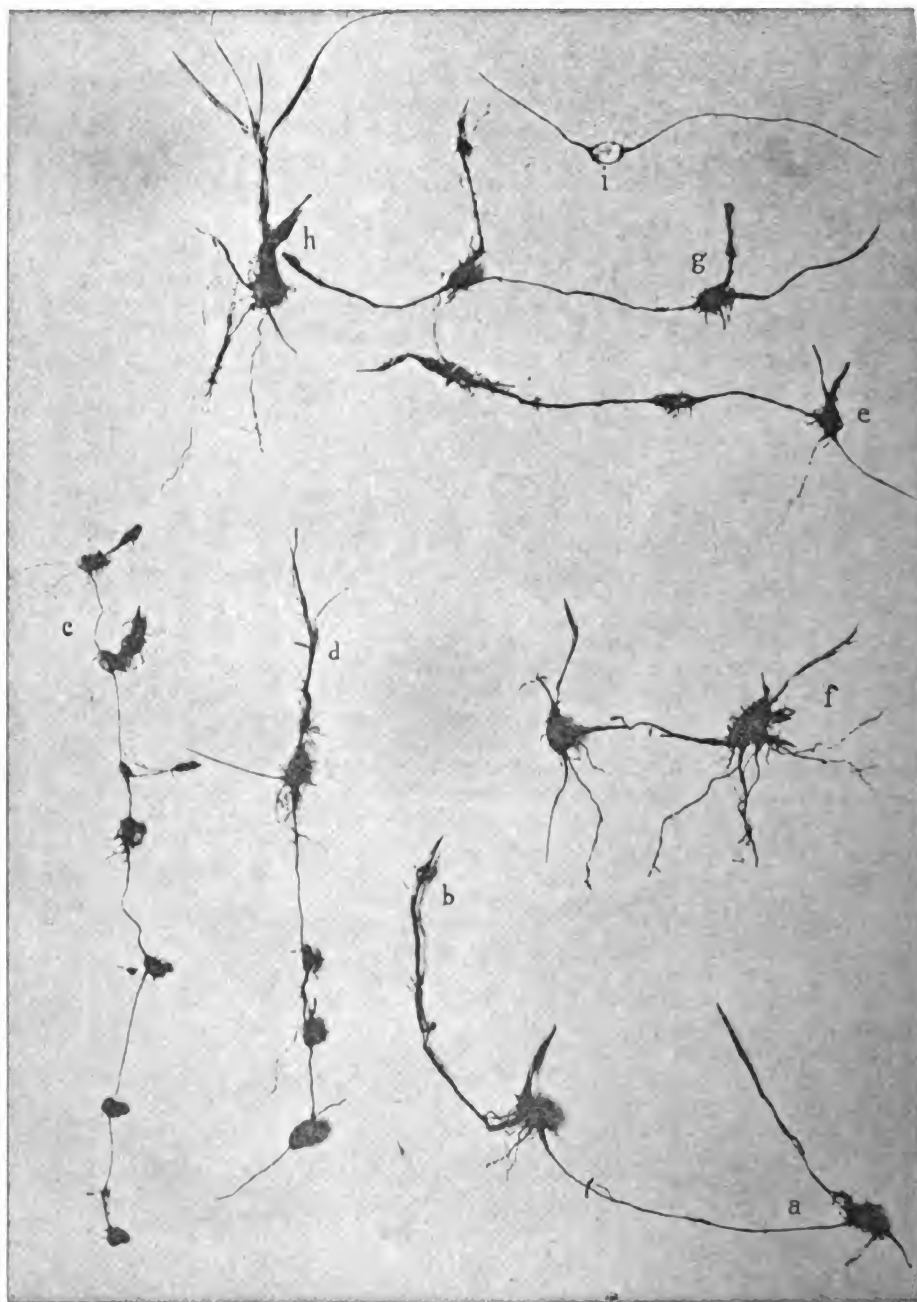
As soon as the leaves are well established above ground, and are drawing sufficient supplies from the atmosphere, white shoots are protruded from the collar just below the ground from amongst the roots. These at first take a slightly downward course, but, when clear of the parent plant, run horizontally, and go through exactly the same course of life as the predecessor from which they sprung; and in this way is formed the widening circle of progeny shown in Plate I., where *a* is the shoot with the tuber beginning to form; *b*, the tuber more advanced, and beginning to emit roots; *c*, the plant well advanced above ground, and already sending out another colony "on its own," but not yet flowering; *d* and *e*, the flower-spikes.

When the nut-grass has sent out two or three of these colonising shoots, it sets about flowering, and devotes itself exclusively to that particular business. The tuber, which we have traced so far, becomes harder, the shoots connecting with the other colonies thrown off become mere dried-up threads, and the flower-spike is sent up. This is three-cornered, from 9 to 10 inches long in cultivated land, and bearing at the top the flower somewhat curiously arranged. First, there are three small leaves like those on the plant (you will remember that I am sparing you botanical descriptions); then just inside these leaves are three little spikes standing well up on the three corners of the stem; then between these are three smaller spikes, not so tall; and in the centre of all a little spike on a shorter stalk than the three outer ones.

When the business of flowering is over, the plant dies down, and all trouble with it is over for that year; but the nut at the base of the plant does not die. It is lying all the winter in readiness to send out its horizontal shoots the moment the warm feel of the earth tells it that it is time to begin its life business. It will never visit the sunlight again, but its children to be born next spring will, and it is ready to send them on their way.

It has been said that when the nut-grass begins to flower it devotes itself exclusively to the matter in hand. This is its vulnerable point, because if you prevent it from flowering, which is the cheapest way of interfering with it, the nut-grass at once sets about repairing damage; and this it does, not by producing new leaves and flowers on the injured shoot, but by sending up a new shoot which has to draw on the old tuber for its initial start and the major portion of its support. The nut gets smaller and weaker just as a seed potato gets weaker and shrivels when the shoots are sent above ground, and for the same reason. Now, if you stop the new shoot, the nut-grass will not give in by any means. It cannot. It simply sends up another shoot, sometimes two, but now ludicrously weak compared to the brave strong fellow which showed above ground in the first instance. The cold weather is coming by this time and fighting your battle for you. The energies of the plant are wellnigh exhausted, and it is a very sick tuber which goes to sleep that winter, and by no means up to the work of colonising which it has to undertake the following spring. For you see it cannot gain any strength when its leaves are not in active work; and as it goes to sleep, so it wakes up. Next year you have an advantage over your enemy, but if you let it alone it will soon recuperate. In digging your ground (I am now speaking of gardens) during the winter, it is as well to dig nut-grass out roughly, but the faddishness of picking up every bit, which some insist on, is a fearful waste of time and money; while as to digging during the summer a little patch at a time, and slowly picking it, there is no better way to insure the spread and continuance of nut-grass in your land.

This finishes the first year's battle in the war with nut-grass, but it is a victory which must be followed up, or the impression made upon the foe will be

**Plate II****NUT-GRASS (*Cyperus rotundus*, Linn.), REDUCED ONE-THIRD:**

lost. I should like to be able to say that a great argument in favour of this way of dealing with the enemy is that the nut-grass cannot get a chance to propagate itself by seed. Of course this is the case so far as it goes elsewhere, but I am compelled to admit that in this place I have never been able to raise a solitary nut-grass plant from seed, though I have tried hard to do so. Two or three years ago I offered a reward of 5s. to any of the employees here who would bring me a nut-grass seedling, or succeed in raising a single plant from seed, but the reward has never been claimed. Whenever the seed was sown, the only result was a crop of another *Cyperus* with minute seed which grows in company with the nut-grass. This is not, of course, a proof that nut-grass does not reproduce its kind from seeds. It has been repeatedly asserted that it does so, but of all the many millions of plants here I have never seen a plant reproduced from seed. There are many plants, as pointed out by Professor Kerner in his magnificent work, "The Natural History of Plants," which change their reproductive methods under conditions which favour the use of one method more than another. He supports this view by an immense range of illustrations (vol. 2, page 452), and there seems little reason to doubt that nut-grass, when it grows under conditions which favour its reproduction by the vegetative method, is a case in point. I am anxious to get fertile seed of nut-grass; and if some Queensland readers will kindly post some apparently sound seeds to me, I shall be glad to do myself the pleasure of posting a copy of "Nicholls' Tropical Agriculture" (one of the best cultural handbooks in existence) to the sender of the seed which first germinates. I am also saving likely seeds here, and am again having it tried under all conditions.

On Plate II., an endeavour is made to illustrate some points about the nut-grass which will afford us hints in the campaign against it. At *a* is shown a shoot which was nipped in the bud at the commencement of its career. It sent out, you will notice, before it was cut down, two shoots. Of these the one going towards the left was the most forward and appearing above ground. When the support was cut off at *a*, the growth of the shorter one was stopped, but the other (nearer to *b*) had formed roots and was peeping above ground; so it went ahead, but after a time the rapid "Avery" nipped this also, and the shoot at *b* was left without a support from the base of operations. You will notice how puny it is compared with the two immediately preceding ones. If left alone, the centre tuber would try to get above ground again with a tuft of leaves. The paralyzing effects of this cutting off the sources of supply is seen in the specimens photographed at *e f g* and *h*. At *i* is shown a slice from the centre of a healthy nut which has not been interfered with.

The greatest depth at which I have ever known nut-grass to grow beneath the surface of the soil is shown at figure *c*, Plate II. It extended for 12 inches beneath the surface, but was deposited in that position by the flood of 1893, which brought down from the upper reaches of the river a good deal of nut-grass in the soil and deposited it in hollows and on the banks of the river. The nut-grass in this case grew vertically, forming a chain of nuts until it reached the light, when the underground shoots began to spread horizontally a few inches beneath the ground, as is its wont. The lower nuts were dead. The qualities which recommended the tubers to the Scythians for embalming purposes preserve the nuts for an almost indefinite time under ground, and it is one of the most difficult of all forms of vegetable life to kill. In lifting an asphalt walk here, which had been down for six years, a few tubers of nut-grass were found still alive under the very centre. Continued shade will kill out nut-grass most effectually. The position on which the large shade garden here was built was one mass of the plant, but after a brief struggle it gave in, and there is now not a blade to be seen. Shade at a little height seems to be more effectual than the placing of any substance directly on the plant. When the shade is but light, the plant never makes any attempt whatever to flower, as if recognising the hopelessness of the task, but goes on propagating itself by tubers only, and when the shade is increased beyond a certain point it quickly dies out, though, as before said, the tubers retain their vitality for a long time,

and their appearance of vitality for an almost indefinite time. It is conceivable that some geologist of the future will be as much puzzled over the tubers of nut-grass dug by him from some long-buried stratum, as are those of our day over fruits and leaves similarly preserved.

If the cases of the tubers of this plant which were found in wells and similar places at great depths were carefully investigated on the spot, it is likely that it would be found they were carried there by some outside agency.

After the plant has been cut down for one year whenever the leaves get to any height (and this can be easily done by a systematic use of the "Avery" garden plough in gardens, market gardens, and small farms, or by means of a horse Planet cultivator on a larger scale), it will be found to come up very weakly the following year, and will then be much more easily dealt with. Do not give it a chance to renew its youth. Your crop, whatever it is, requires cultivating for its own sake, even if there were no nut-grass in the world, and it will pay for the labour to do it on this account alone. If you can arrange to have a crop which will shade the land just as the nut-grass is coming above ground in the spring, it will be a great point in your tactics against it.

A crop of cowpea is good for the purpose of smothering it, though it must not by any means be imagined that it is only necessary to smother it for a short time. New beds are often opened up on the higher ground here, where a spade or plough has in all probability never been inserted. An immediate and plentiful crop of nut-grass is the invariable result, and it always takes a year or two before it can be reduced to bounds. To deal with this enemy you must attack it with system. Happy-go-lucky methods only mean a loss of power and poor results, and it must be fought at the right time—i.e., during the summer months, and until it begins to die away. Do not trouble about it when it is at rest, but have your crop as far advanced as possible, or be ready with your cultivator when it wakes up.

Whether the plant is propagated in your district from the seed or from the tubers alone, or from both together (and it is my firm conviction that it is propagated in all three ways in different places), you will, by preventing it from forming flower-heads, weaken its vegetative powers, destroy its chances of propagation, and so vitiate it that, though it will have to be reckoned with by Queensland farmers and gardeners while grass grows, it will be eliminated from the somewhat overcrowded list of pests.

The following extract from an article by the Hon. G. D. Tillman, quoted by Mr. L. H. Dewey, of the United States Department of Agriculture, shows that the Queensland farmer is not alone in having to fight this plant:—

"It is a waste of effort to attack 'coco' (nut-grass) in winter either by digging, or ploughing, or turning hogs on it. The best time for fighting it is between midsummer and frost time. Although myriads of the sprigs will show themselves above ground a day or two after the working of the soil, even in the spring months, yet no seed stems will show themselves till late in the season, and the secret of success is to cut while in the flowering stage at the latest, and the sooner the better. One cause that has enabled 'coco' (nut-grass) so long and so defiantly to hold its sway in the south is that we have so few crops which are hoed or ploughed in the fall of the year."

In Queensland, nut-grass is chiefly remarked as a nuisance in the early spring, and at that time there is always a great talk of getting rid of it, or rather a good deal of grumbling at the apparent impossibility of getting rid of it. At this time it forces itself upon attention, because it is a very conspicuous object with its fresh green leaves showing everywhere through cultivation and injuring young plants which are not yet sufficiently advanced to bid it defiance. But later on, when the real time comes for fighting it to advantage, it is found that the crop is already so far advanced that its ill effects and appearance are not so evident, and so it is let alone for another year, and in the meantime it spreads and waxes strong.



Wherever a manure heap is formed here, nut-grass always disappears from the place beneath, and if the manure is removed after about a year the ground remains free from the plant until it works in from the adjoining ground or is carried in by some means.

In the nurseries, &c., here, nut-grass used to be a plague. Of course it is still present, and probably ever will be, as it has ever been in all regions where it is known, and they are many; but it is not present in a form to do any harm worth considering, because a systematic system of control is established. It cannot be eradicated any more than droughts can be stopped, but it can be accepted as one of the difficulties to be overcome, and so dealt with as to be rendered comparatively harmless.

That it has not been tackled at the right time and in the right way, "explains," to again quote the pamphlet of the United States Department of Agriculture, "the whole story of its universal triumph over the patience, sweat, curses, and blows of the millions who have warred on it."

DAKOTA MILLET.

By HENRY A. TARDENT,

Manager of the Biggenden Experiment Farm

THIS is another good fodder plant well worth a trial in Queensland. In America it is well thought of by the farmers of the west, as it can stand uninjured a considerable amount of dry weather. It grows in abundant stools, and its vertical stems reach a height of from 4 to 6 feet. They are well provided with alternate dark-green leaves, which form practically the best part of the plant. As a green fodder it is greatly relished by all kinds of stock. It can also be turned into good hay and chaff, though somewhat difficult to cure properly, the stems getting dry much slower than the leaves. It makes a good ensilage, especially when passed first through the chaffcutter. The heads are elongated and spindle-shaped, like those of the ordinary pearl millet. The seeds are good for poultry and pigs. On the coast the Dakota millet can be sown broadcast at the rate of from 15 to 20 lb. per acre. In the dry West it is better to drill it in—1 foot apart—in which case from 8 to 10 lb. of seed will be sufficient to sow one acre. In a fair season the returns will be from 15 to 20 bushels of seeds per acre, and from 8 to 12 tons of green stuff the result of two to three successive cuttings.

THE WOOL INDUSTRY FROM A BUYER'S STANDPOINT.

No. 2.

By F. E. STURMFELS.

THE average merino wool produced in the Australian colonies between 30 and 40 years ago was of quite a different type to what it is at the present date. Classing in those days was of rare occurrence; and where it was attempted, the result was very unsatisfactory. It therefore devolved upon the manufacturer to sort the wool, and as the machinery then was not so perfect as it is now, it was necessary to pay particular attention to this process. It was not unusual to divide the fleece into 12 qualities, and sometimes more; but with the advancement which has taken place in breeding of the sheep, together with the improvements in machinery for the combing and spinning of wool, sorting is almost a thing of the past as regards the bulk of carefully handled Australian merinos, this result being, to a great extent, due to the fact that, as we have now to deal with a more even fleece, classing in the colonies has taken the place

of sorting at home, to the advantage of the grower, who is now reaping the benefits. It will be seen from the foregoing that a good style of classing is essential, but at the same time this can be carried too far, and for this reason growers, and particularly small growers, will do well to confine their classing to as few qualities as possible, according to the number of sheep to be shorn.

Two styles of classing may be chosen—the first one into grades, and the second into colour. In the event of adopting the latter method, all fleeces of the same appearance and colour should be classed as follows, the sexes being kept separate:—The bright, light, and clean wool should be classed together and branded 1st fleece hoggets, ewes, or wethers; the fleeces which are slightly dingy or less bright than the first should be branded 2nd fleece hoggets, ewes, or wethers; while very dingy, earthy, and heavy fleeces should go to make the 3rds, which may be branded “fleece” only. The same classification applies to skirts.

CLASSING BY GRADES.—In this case the qualities mostly appreciated by manufacturers are:—

1st Combing.—A wool of good length, fine, sound, and of shafty staple, bright in colour.

2nd Combing.—A wool of medium length and medium colour, not quite so fine in fibre, but of sound staple.

1st Clothing.—This should comprise the finest of short wool, provided it is sound, bright, and clean.

2nd Clothing.—This quality should contain all short-stapled fleeces, not quite so fine as in the former grade and of less brightness.

A Fleece.—In this class should be thrown all mushy, dingy, earthy, and faulty fleeces.

The skirting should be done in the following manner:—

1st Pieces.—Bulky wool of an even bright colour and of good length.

2nd Pieces.—The lower parts of the first pieces, generally not so bright, while heavier in grease and lower in quality.

Stained Pieces.—All parts discoloured and partly matted should be included in this brand.

Bellies.—The bellies should always be kept by themselves, and, where the quantity will allow, they might advantageously be made into two sorts: the lighter ones as 1st bellies, and the heavy ones as 2nd bellies.

Locks.—All dark points trimmed off the fleeces and all which falls from the tables will constitute locks. Dags, however, should be scrupulously taken off the wool and thrown on the refuse heap.

HOW TO CLASS BY COLOUR.—The fleece having been shorn, is taken up and thrown with a sweep on to the table, where it is well spread out. On no account should the shorn side be uppermost, as in this manner the difference in brightness cannot possibly be ascertained, but, if the fleece appears as on the sheep's back on the table, the difference between a bright fleece and a dingy one will at once be noticeable. The different grades are therefore easily kept separate.

HOW TO CLASS BY GRADES.—Our aim here is to get as near as possible all fleeces of a similar appearance and length together. When we say as near as possible, we mean that, say, a good bright fleece of about 2 to 2½ inches in length, and sound in staple, can be put with a similar quality of, say, 3 inches or more, and *vice versa*, with shorter and inferior grades.

To ascertain the average length of the staple (the fleece being spread out as explained above), a staple or lock should be rapidly drawn out of the fleece with the thumb and index finger of the right hand, and the other end of the

staple should be immediately seized by the left hand and brought over on to the thumb of the right hand, when the average length can be easily gauged and determined. The soundness of the staple should then be tried, by holding the ends of the staple in both hands, when a sharp pull will disclose the degree of soundness. The fineness of the wool must now be ascertained, and to do so the staple should be taken and opened with the two hands from top to bottom. A careful examination will enable the grade to be ascertained, as well as the cleanness. In thus determining the degree of fineness of the wool, some little practice is needed, but with perseverance no one need despair of acquiring proficiency.

In our next we shall treat the question of skirting, and will also give a list of technical terms and their meanings.

SHIPPING HAY.

WE learn from a southern exchange that a Ballarat firm has secured an order for 500 tons of hay in trusses for the Cape. This hay is worth in Victoria about £2 per ton. The *Age* gives the freight at £5 per ton weight, owing to the bulk of this article. This and other charges would bring the cost at Capetown or Natal to £8 per ton, or four times the original cost of the hay.

To ship hay in trusses, in the ordinary acceptance of the term "truss," would appear to be a most expensive way of getting forage to South Africa. The price of the prime oat hay in Victoria, dumped in very nice bales each weighing about 2 cwt., and which is hydraulically pressed and bound together with two hoop-irons and eight battens on each bale, is £3 per ton f.o.b. Geelong or Melbourne. The price of chaff dumped—that is, four bags bound into one bale with battens and hoop-irons—is £2 5s. to £2 10s. per ton, but likely to advance a little. Some of the forage which the War Office authorities have been buying is a compressed fodder, which is only made up in Melbourne, and consists of bran, crushed oats, and chaff made up in very neat packages about 12 inches wide, 18 inches long, and 15 inches thick. Each package is made up in canvas with two wires, and contains exactly 1 cwt. Such packages would stow admirably in a ship's hold. As 40 cubic feet go to the ton measurement, twenty-two of these bales would measure a little over a ton. Its selling price in Brisbane (with a 25 per cent. duty added) is £7 10s. per ton. There is no doubt, judging by the sample shown to us by Messrs. Robert Little and Co., of Roma street, this is a most excellent forage, and one which effectually does away with all waste. The company, however, have patented the process by which this forage is produced, and Queensland farmers or possible exporters will have to bale the hay in the ordinary manner, and have it dumped on arrival in Brisbane. The cost of dumping would be as follows:—Two bales in one (farmers' bales), receiving and delivering, and supplying hoop-iron, per bale, 1s. 6d. Chaff in bags, four bags in one, including hoop-iron, from 4d. to 5½d. per bag. There are presses of a kind which turn out small compact bales at a great rate; in fact, the speed is only limited by the rapidity with which the wires can be fastened. We believe that there are several such presses in the colony amongst the farmers above and below the Range. It is satisfactory to learn that diligent inquiries are being made as to the best means to deal with the large quantity of valuable forage so suddenly thrown on the farmers' hands, and no doubt long before the hay is ready for baling some satisfactory way out will be found. Meanwhile it must not be forgotten that, if even £2 per ton can be obtained for it, it is better than a wheat crop, and will put £60,000 at least into the farmers' pockets.

In some parts of America they are adopting a system of pressing chaff into cubes pressed by hydraulic power without the use of bags, the bales being bound by wire supported by battens. It is said that after the wire is removed the chaff separates into its ordinary condition after a lapse of 24 hours.

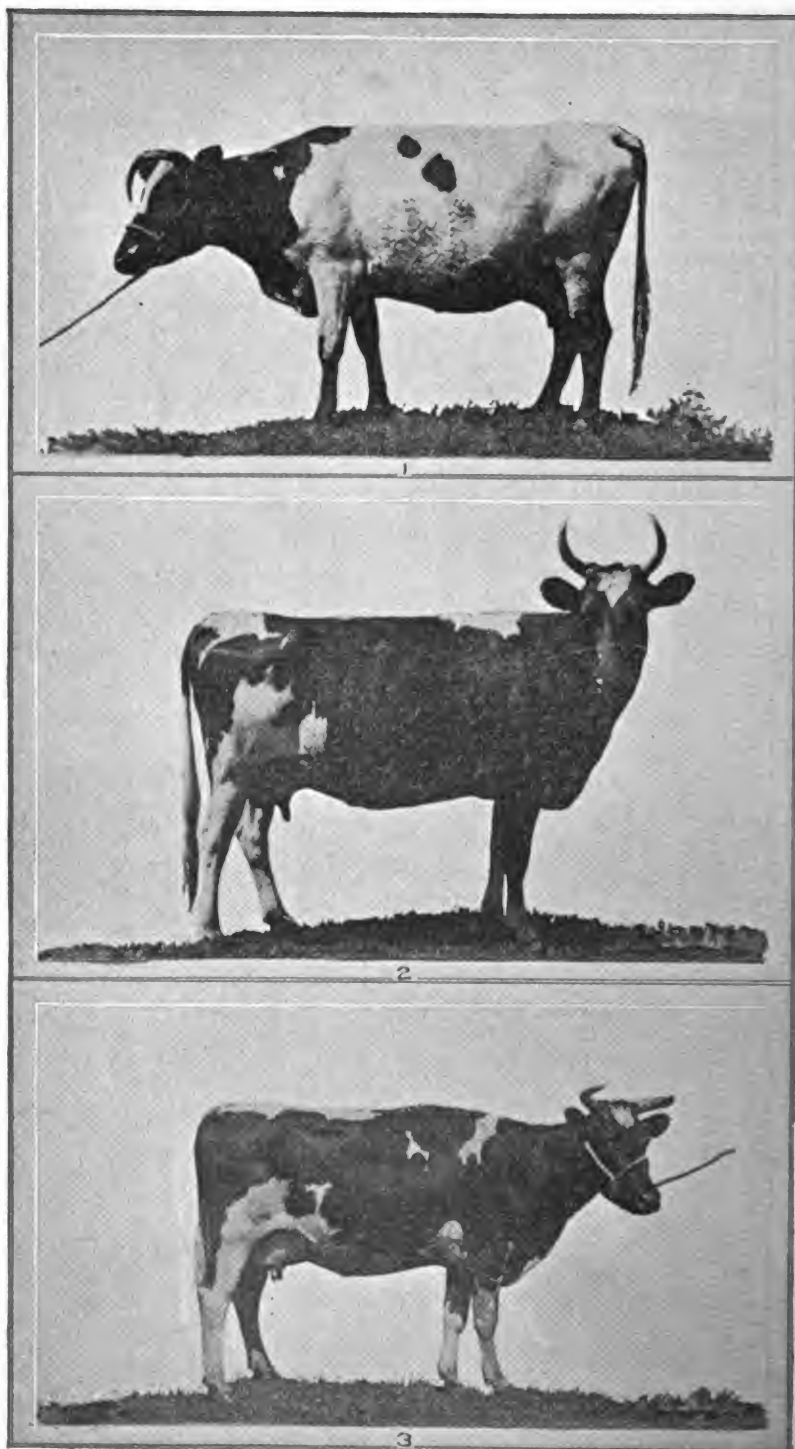
THE WORLD'S WHEAT SUPPLY.

CABLES are continually received that in this or that wheat-growing country the crops are heavy or light, that they are a failure here or a "bumper" there. Most wheat-growers, however, are wondrously ignorant of the yields of other countries than their own. It is with the view of giving an intelligible idea of the actual production of various parts of the world that the following figures are given, showing the actual yields during 1898 and the estimated yields during 1899:—

| | | 1898. | | 1899. |
|----------------|-----|---------------|-----|---------------|
| | | Bushels. | | Bushels. |
| Austria | ... | 46,400,000 | ... | 42,000,000 |
| Hungary | ... | 120,000,000 | ... | 136,000,000 |
| Belgium | ... | 18,000,000 | ... | 16,000,000 |
| Bulgaria | ... | 40,000,000 | ... | 28,000,000 |
| Denmark | ... | 4,000,000 | ... | 4,000,000 |
| France | ... | 360,000,000 | ... | 328,000,000 |
| Germany | ... | 112,000,000 | ... | 104,000,000 |
| Greece | ... | 6,000,000 | ... | 6,000,000 |
| Holland | ... | 4,800,000 | ... | 5,200,000 |
| Italy | ... | 128,000,000 | ... | 120,000,000 |
| Portugal | ... | 6,000,000 | ... | 4,000,000 |
| Roumania | ... | 56,000,000 | ... | 26,000,000 |
| Russia | ... | 352,000,000 | ... | 296,000,000 |
| Caucasus | ... | 48,000,000 | ... | 44,000,000 |
| Servia | ... | 12,000,000 | ... | 10,000,000 |
| Spain | ... | 92,000,000 | ... | 80,000,000 |
| Sweden | ... | 4,400,000 | ... | 4,000,000 |
| Switzerland | ... | 4,000,000 | ... | 4,000,000 |
| Turkey, Europe | ... | 28,000,000 | ... | 23,000,000 |
| United Kingdom | ... | 80,000,000 | ... | 66,000,000 |
| Total Europe | ... | 1,521,600,000 | ... | 1,355,200,000 |
| Algeria | ... | 20,000,000 | ... | 12,000,000 |
| Tunis | ... | 6,000,000 | ... | 8,000,000 |
| Argentina | ... | 80,000,000 | ... | 72,000,000 |
| Australasia | ... | 52,000,000 | ... | 52,000,000 |
| Asia Minor | ... | 40,000,000 | ... | 48,000,000 |
| Canada | ... | 68,000,000 | ... | 4,000,000 |
| Cape Colony | ... | 4,400,000 | ... | 4,000,000 |
| Chili... | ... | 16,000,000 | ... | 16,000,000 |
| Egypt | ... | 10,000,000 | ... | 10,000,000 |
| India | ... | 248,000,000 | ... | 232,000,000 |
| Persia | ... | 20,000,000 | ... | 20,000,000 |
| Syria | ... | 12,000,000 | ... | 12,000,000 |
| U.S. America | ... | 696,000,000 | ... | 520,000,000 |
| Uruguay | ... | 12,000,000 | ... | 12,000,000 |
| Mexico | ... | 12,000,000 | ... | 12,000,000 |
| Total | ... | 1,300,400,000 | ... | 1,090,000,000 |
| The world | ... | 2,822,000,000 | ... | 2,445,200,000 |

The Australasian figures for 1899 are given as the same as those for 1898 in order to make the returns approximately complete. These returns have just come forward by mail from London, being the first official estimate published on the authority of "Beerbohm."

GREAT BRITAIN produces as much wheat as Argentina, and about twice as much as Australia, despite all we hear of her decadent agricultural industries. This year her wheat crop is estimated at between $9\frac{1}{2}$ and 10 millions of quarters, or about 75,000,000 to 80,000,000 bushels.—*Farm and Dairy*.



DAIRY CATTLE AT ST. HELENA.

Dairying.

THE ST. HELENA HERD.

THROUGH the courtesy of the Comptroller of Prisons, Captain C. Pennefather, we are enabled to present our readers with illustrations of seven of the best pure Ayrshire cows of the dairy herd at the Penal Establishment of St. Helena, together with a photograph of the fine Ayrshire bull, Lionel. The pedigrees of all these fine animals, together with the yield of milk of the cows for the past year, are also given below:—

LADY MAY 2ND.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|--------------------|---------------------|--------------|----------------------------|
| Lady May 2nd... .. | September, 1898 ... | 906 | Twenty-six days' milk only |
| | October " ... | 1,017 | |
| | November " ... | 807 | |
| | December " ... | 790 | |
| | January, 1899 ... | 700 | |
| | February " ... | 619 | Twelve days' milk only |
| | March " ... | 551 | |
| | April " ... | 409 | |
| | May " ... | 329 | |
| | June " ... | 189 | |
| | July " ... | 31 | |
| | | 6,348 | |

PEDIGREE.

LADY MAY 2nd; born 18th September, 1887.

Colour, white with little light-red.

Sire—Duke of Randwick (imported).

Dam—Lady May, by Rival of Drumlanrig (78 A.H.B. of A.)

g d Flora, by Rob Roy.
 g g d Daisy, by Donald.
 g g g d Molly, by Rob.
 g g g g d Maggie.
 g g g g g d Annie (imported).

Duke of Randwick (imported), by Beaconsfield; dam, Snowdrop 2nd of Drumlanrig; g d, Snowdrop of Drumlanrig.

The Duke of Randwick was imported by Mr. J. E. Pemell, of Sydney, from the Duke of Buccleuch's herd in Scotland.

RUBY'S PRIDE.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|---------------------|--------------------|--------------|-------------------------|
| Ruby's Pride | November, 1898 ... | 425 | Fifteen days' milk only |
| | December " ... | 851 | |
| | January, 1899 ... | 752 | |
| | February " ... | 617 | |
| | March " ... | 530 | |
| | April " ... | 418 | Still milking |
| | May " ... | 366 | |
| | June " ... | 361 | |
| | July " ... | 372 | |
| | August " ... | 318 | |
| | | 5,010 | |

PEDIGREE.

RUBY'S PRIDE; born 25th February, 1894.

Colour, dark-red and little white.

Sire—Duke of Ageston 10th.

Dam—Matilda 2nd, by Southern Chief.

g d Matilda, by Sovereign.

g g d Governess, by Baron 2nd of Drumlanrig (imported).

Southern Chief, by Baron 2nd of Drumlanrig (imported)*; dam, Queen (imported).

Duke of Ageston 10th, by Southern Chief; dam, Lady Bird, by Sir Walter Scott, by Cardigan 4th; dam, Beauty, by Billy (imported); g d, Lady, by Dunlop; g g d, Flora, by Rob Roy; g g g d, Daisy, by Donald; g g g g d, Molly, by Rob; g g g g g d, Maggie; g g g g g d, Annie (imported).

PRIMROSE.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|--------------|---------------|--------------|-----------------------------|
| Primrose | January, 1899 | 568 | Twenty-five days' milk only |
| | February | 603 | |
| | March | 372 | |
| | April | 365 | |
| | May | 360 | Still milking |
| | June | 303 | |
| | July | 273 | |
| | August | 296 | |
| | | 3,140 | |

PEDIGREE.

PRIMROSE 2ND; born 2nd September, 1888.

Colour, red with a little white.

Sire—Southern Chief.

Dam—Primrose, by Earl of Cardigan 4th.

g d Jean, by Ferguson's Jock, by Burn's Jock (imported).

g g d Belle, by Hobbie (imported).

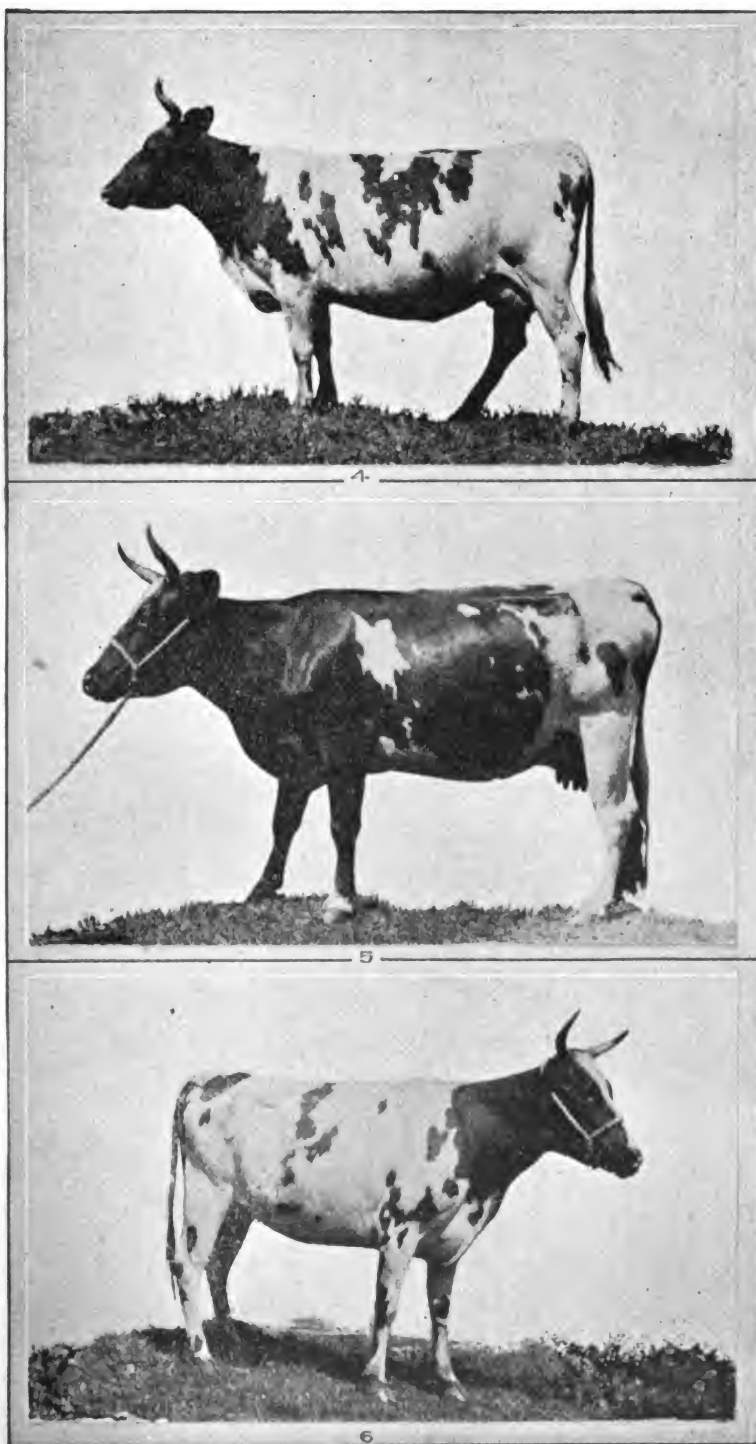
Hobbie, by Wattie; dam, Fleckie, imported by the late Mr. Thomas Hamilton.

Fleckie won several prizes before leaving Scotland.

EDITH'S PRIDE.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|---------------|---------------|--------------|----------------------------|
| Edith's Pride | August, 1898 | 41 | Two days' milk only |
| | September | 831 | Twenty-six days' milk only |
| | October | 865 | |
| | November | 694 | |
| | December | 665 | |
| | January, 1899 | 573 | Six days' milk only |
| | February | 478 | |
| | March | 388 | |
| | April | 240 | |
| | May | 123 | |
| | June | 10 | |
| | | 4,908 | |

Southern Chief's stock won a large number of prizes in Victoria, including the Champion ship for Cows, three years in succession, at the National Shows in Melbourne.



DAIRY CATTLE AT ST. HELENA.

PEDIGREE.

EDITH'S PRIDE; born 12th July, 1892.

Colour, red and white.

Sire—Ida's Chief.

Dam—Primrose 2nd, by Southern Chief.

g d Primrose, by Earl of Cardigan 4th.

g g d Jean, by Ferguson's Jock, by Burn's Jock (imported).

g g g d Belle, by Hobbie (imported).

Ida's Chief, by Southern Chief; dam, Ida, by Scotchman (imported); g d, Flora, by Baron 2nd of Drumlanrig (imported).

BELLA.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|--------------|-------------------|--------------|--|
| Bella | August, 1898 ... | 83 | Five days' milk only |
| | September " ... | 729 | |
| | October " ... | 673 | |
| | November " ... | 561 | |
| | December " ... | 522 | |
| | January, 1899 ... | 510 | |
| | February " ... | 397 | |
| | March " ... | 379 | |
| | April " ... | 270 | |
| | May " ... | 232 | |
| | June " ... | 197 | This is Bella's first calf, and she is still milking |
| | July " ... | 199 | |
| | August " ... | 278 | |
| | | 5,030 | |

PEDIGREE.

BELLA; born 9th September, 1895.

Colour, red and white.

Sire—Sir John.

Dam—Dolly, by Ida's Chief.

g d Favourite's Pride, by Southern Chief.

g g d Favourite 2nd, by Young Baron.

g g g d Favourite, by Duke, by Ayrshire Jock (imported).

g g g g d Maud, by Earl of Cardigan 4th.

g g g g g d Tibbie, by Burn's Jock (imported).

Sir John, by Ada's Chief; dam, Matilda 2nd, by Southern Chief; g d, Matilda, by Sovereign; g g d, Governess, by Baron 2nd of Drumlanrig (imported).

Ada's Chief, by Southern Chief; dam, Drumlanrig's Ada 3rd (A.H.B. 3462), by Duke of Randwick (imported); g d, Drumlanrig's Ada 2nd (A.H.B. 2528); g g d, Ada of Drumlanrig (imported) (A.H.B. 617).

LADY VIOLET.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|--------------------|---------------------|--------------|----------------------------|
| Lady Violet | September, 1898 ... | 776 | Twenty-six days' milk only |
| | October " ... | 844 | |
| | November " ... | 671 | |
| | December " ... | 630 | |
| | January, 1899 ... | 541 | |
| | February " ... | 444 | |
| | March " ... | 348 | |
| | April " ... | 234 | |
| | May " ... | 147 | Six days' milk only |
| | June " ... | 12 | |
| | | 4,647 | |

PEDIGREE.

LADY VIOLET; born 28th March, 1892.

Colour, light-red and white.

Sire—Ida's Chief.

Dam—Violet's Pride, by Duke of Barbiston 5th.

g d Violet 3rd, by Southern Chief.

g g d Violet 2nd, by Sir Walter Scott.

g g g d Violet, by Dunlop.

g g g g d Fanny, by Rob Roy.

g g g g g d Rosey, by Old Rob Roy.

g g g g g g d Flora, by Rob.

g g g g g g g d Mollie, by Rob.

g g g g g g g g d Maggie.

g g g g g g g g g d Annie (imported).

Duke of Barbiston 5th, by Duke of Randwick (imported); dam, Duchess of Randwick (imported).

The Duke of Randwick and Duchess of Randwick were imported by Mr. J. E. Pemell, of Sydney, from the Duke of Buccleuch's herd, in Scotland.

GRACE'S PRIDE.

| Name of Cow. | Date. | Lb. of Milk. | Remarks. |
|---------------|----------------|--------------|--------------------------|
| Grace's Pride | February, 1899 | 497 | Eighteen days' milk only |
| | March | 794 | |
| | April | 563 | |
| | May | 447 | |
| | June | 374 | Still milking |
| | July | 379 | |
| | August | 412 | |
| | | 3,466 | |

PEDIGREE.

GRACE'S PRIDE; born 23rd July, 1892.

Colour, red and white.

Sire—Ida's Chief.

Dam—Annie's Pride, by Duke of Barbiston 5th.

g d Annie 2nd, by Young Baron.

g g d Annie, by Laird o' Cockton.

g g g d Bessie, by Prince.

Young Baron, bred by Messrs. A. and J. McFarlane, was the champion bull from a yearling to a 4-year-old at the principal shows of New Zealand, and was sold in Sydney for 150 guineas. He is by Teviot; dam, Fancy (2519 A.H.B.); g d, Rosina, by Duke of Buccleuch. Rosina was awarded several prizes both as an Ayrshire cow and dairy cow. Duke of Buccleuch, by Teviot; dam, Eva, by Scottie; g d, Maud, by Hobbie; g g d, Favourite, by Brindle; g g g d, Jeannie, by Ferguson's Jock; g g g g d, Leddie (imported), a prize-taker in Scotland and New Zealand. Hobbie, by Wattie; dam, Fleckie, imported by late Mr. Thos. Hamilton. Fleckie won several prizes before leaving Scotland.

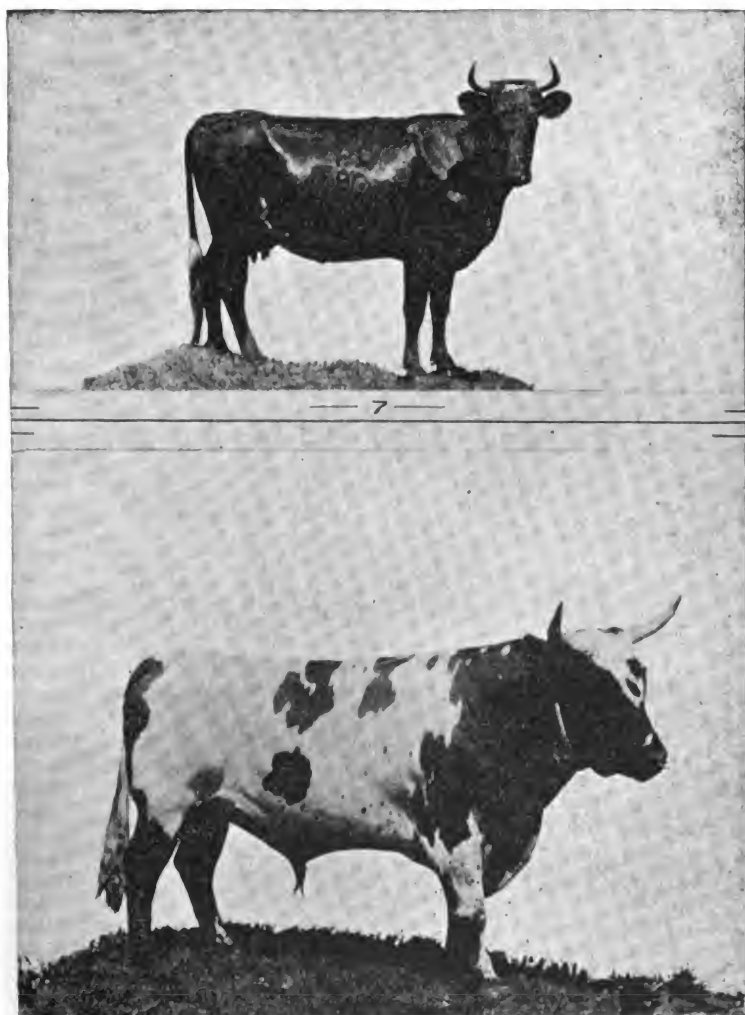
Prince, by Baron Renfrew; dam, Lovely Jane, by Young Templeton; g d, Lady, by Brogden; g g d, Jean, by Tapui.

Baron Renfrew, by Teviot; dam, Fancy 1st of Bogside (imported), was bred by Mr. John Caldwell, of Bogside, Ayrshire, Scotland, and gained 1st prize at Dundonald Show, 1881; 1st at Kilmarnock, 1881; 1st at Irvine, 1881; 1st in Dundonald Derby of 39 entries, 1882; and 1st for 3-year-old cow in milk at Dundonald, 1882.

Baron Renfrew took 1st prize in Oamaru, 1885; 1st at Dunedin, 1885 and 1886; 1st at Victoria National Agricultural Society's Show, 1887; and 1st and Champion, Sydney, 1890 and 1891.

Teviot, by Baron 2nd of Drumlanrig (imported); dam, Queen of the West (imported).

Plate OL.



DAIRY CATTLE AT ST. HELENA.

PEDIGREE OF THE PURE AYRSHIRE BULL, LIONEL.

Bred by Mr. Thomas L. Peate, The Grange, Newmarket, Brisbane.

Calved 6th April, 1894.

Sire—Prince.

Dam—Lovely, by Jock of Oakbank,

g d Lovely Jane, by Young Templeton.

g g d Lady, by Brogden.

g g g d Jean, by Tapui.

Prince, by Baron Renfrew; dam, Lovely Jane (as above).

Baron Renfrew, by Teviot; dam, Fancy 1st of Bogside (imported); was bred by Mr. John Caldwell, of Bogside, Ayrshire, Scotland, and gained first prize at Dundonald Show, 1881; 1st at Kilmarnock, 1881; 1st at Irvine, 1881; 1st in Dundonald Derby of 39 entries, 1882; and 1st for 3-year-old cow in milk at Dundonald, 1882.

Baron Renfrew took 1st prize in Oamaru, 1885; 1st at Dunedin, 1885 and 1886; 1st at Victoria National Agricultural Society's Show, 1897; and 1st and Champion, Sydney, 1890 and 1891.

Teviot, by Baron 2nd of Drumlanrig (imported); dam, Queen of the West (imported).

Lovely was 2nd to same owner's Fancy at Brisbane, 1894, and 2nd to Messrs. Archer Brothers' Tibby, of Waitate, at Rockhampton, 1895, where she won the special milking prize of £3, and also a £1 1s. sweepstakes prize for the best milch cow, tested by the Babcock tester; Tibby, of Waitate, who beat her in the Ayrshire cow class, being 3rd in each instance. At the 1896 show, same place, she won the milking prize with a *record* of 36½ lb. milk for the one day's milking, and tied Messrs. Archer Brothers' Cherry for the butter prize with 167½ oz. butter from the day's milk.

Jock of Oakbank, by Southern Chief; dam, Dinah, by Dunlop.

Southern Chief, by Baron 2nd of Drumlanrig (imported); dam, Queen (imported).

Dinah won 1st prize at Heidleberg in 1879-81-82; the National Agricultural Society's 1st prize (Victoria); the International Exhibition Medal, and Messrs. Briscoe and Co.'s silver plate for the best male or female Ayrshire in the yard at the National Agricultural Society's Exhibition, Melbourne, 1880; 1st at West Bourke, 1881; 1st at Ballarat Grand National, 1881 and 1882; and 1st at National Agricultural Society's Show at Melbourne in 1881.

Dunlop, by Tam o' Shanter; dam, Lady of the Lake; took 1st prize, Sydney, 1879; 1st, Sydney Grand International, 1879; 1st at Kiama, 1881; also 1st for best dairy bull, and 1st for the best bull in the yard; 1st at Moss Vale, 1882; 1st at Camden, 1883; and 1st at Sydney, 1883.

Lovely Jane took 1st prize, Sydney, 1885; 1st and Champion, Sydney, 1887; 1st and £10, Centennial Champion, Sydney, 1888; V.H.C., Melbourne, 1888, over four months calved; special 1st and champion, Sydney, 1889; and special 1st in dry cow class, Sydney, 1896; and beaten by same owner's Edith by two points only, Edith being in full milk and Lovely Jane dry.

It will be seen that Lionel has two crosses of the justly celebrated cow Lovely Jane, by bulls of the very highest class; the sire Prince being by Baron Renfrew, whose dam, Fancy 1st of Bogside, was said to be the best cow that ever left Scotland—she died from milk fever in New Zealand; while the sire of the dam, Jock of Oakbank, traces back through such high-class cows as Dinah and Katie to Annie (imported).

Lionel took 1st prize in his class and Reserve Champion at Brisbane, 1895; 1st in his class, and 1st for the best bull and two of his progeny, at Brisbane, 1896; 1st prize and Reserve Champion, Brisbane, 1897; being beaten for champion by Young Prince, bred at St. Helena.

THE DAIRY HERD.
QUEENSLAND AGRICULTURAL COLLEGE.
RETURNS FROM 1ST AUGUST TO 31ST AUGUST, 1899.

| Name of Cow. | Breed. | Date of Calving. | Yield. | Percent. Butter Fat, Babcock Test. | Com- mercial Butter. | Remarks. |
|------------------|-----------------|------------------|--------|--|----------------------------|----------|
| | | | Lb. | | Lb. | |
| Annie Laurie | Ayrshire ... | 12 June, 1899 | 763.5 | 3.7 | 31.6 | |
| Blink ... | " ... | 23 April " | 561 | 3.8 | 23.87 | |
| Isabelle ... | " ... | 2 June " | 438 | 3.5 | 19.13 | |
| Lena ... | " ... | 17 June " | 614 | 3.7 | 25.44 | |
| Linnett ... | " ... | 19 June " | 819 | 3.6 | 33.02 | |
| Rosebud ... | " ... | 13 April " | 475 | 3.8 | 20.21 | |
| Ream ... | " ... | 26 June " | 679 | 3.5 | 26.61 | |
| Baroness ... | Jersey ... | 13 June " | 565 | 4.4 | 27.84 | |
| Content ... | " ... | 11 July " | 635 | 4.2 | 29.86 | |
| Connie ... | " ... | 18 Nov., 1898 | 138 | 4.9 | 7.57 | |
| Effie ... | " ... | 10 Feb., 1899 | 352 | 4.3 | 16.94 | |
| Eileen ... | " ... | 13 Aug. " | 315 | 4.1 | 14.46 | |
| Jersey Belle ... | " ... | 4 July " | 551 | 4.4 | 27.14 | |
| Stumpy ... | " ... | 1 July " | 731 | 4.4 | 36.01 | |
| Opale ... | " ... | 24 Feb. " | 311 | 4.6 | 16.01 | |
| Playful ... | " ... | 6 July " | 342 | 4.1 | 15.7 | |
| Dairymaid ... | Holstein ... | 27 Feb. " | 314 | 3.7 | 13.0 | |
| Fancy ... | South Coast ... | 7 May " | 511 | 3.8 | 21.74 | |
| Misery ... | " ... | 4 May " | 442 | 3.7 | 18.31 | |
| Gertie ... | Grade Shorthorn | 3 June " | 582 | 3.4 | 22.15 | |
| Biddy ... | " ... | 18 May " | 698 | 3.9 | 30.48 | |
| Ginger ... | " ... | 17 June " | 451 | 3.4 | 17.17 | |
| Lady ... | " ... | 6 April " | 467 | 3.5 | 18.3 | |
| Leopard ... | " ... | 23 Nov. " | 472 | 3.4 | 17.96 | |
| Lucy ... | " ... | — Oct., 1898 | 382 | 3.9 | 16.67 | |
| Peggy ... | " ... | 14 July, 1899 | 478 | 3.8 | 20.34 | |
| Rose ... | " ... | 11 Feb. " | 568 | 3.4 | 21.62 | |
| Pansy ... | Devon ... | 7 Oct., 1898 | 384 | 3.8 | 16.34 | |
| Ranger ... | Grade Shorthorn | 9 June, 1899 | 579 | 3.3 | 21.39 | |
| Rusty ... | " ... | — Oct., 1898 | 187 | 3.8 | 7.95 | |
| Roany ... | " ... | 12 June, 1899 | 593 | 3.5 | 23.24 | |
| Stranger ... | " ... | 15 Aug. " | 345 | 3.7 | 14.29 | |
| Star ... | " ... | 17 Dec., 1898 | 594 | 3.5 | 23.28 | |
| Trial ... | " ... | — Sept. " | 411 | 3.9 | 17.94 | |
| Whiteflank ... | " ... | 4 June, 1899 | 797 | 3.6 | 32.13 | |
| Empress ... | " ... | 23 Aug. " | 118 | 3.8 | 5.02 | |
| Hilda ... | Shorthorn | 1 Mar. " | 189 | 3.8 | 8.06 | |
| Louisa ... | " ... | 4 May " | 441 | 3.4 | 18.76 | |
| May ... | " ... | 26 May " | 333 | 3.6 | 13.41 | |
| Nestor ... | " ... | 27 Feb. " | 472 | 3.8 | 20.08 | |
| Plover ... | " ... | 25 April " | 562 | 3.5 | 22.03 | |
| Queenie ... | " ... | 20 April " | 521 | 3.9 | 22.75 | |
| Maggie ... | " ... | 5 April " | 361 | 3.7 | 14.95 | |

Dried off 20-8-99.

Dry, 25-8-99.

Dried off 28-8-99.
With first calf.

RETURNS FROM 1ST SEPTEMBER TO 30TH SEPTEMBER, 1899.

| | | | | | | |
|------------------|--------------|---------------|-----|-----|-------|--|
| Annie Laurie | Ayrshire ... | 12 June, 1899 | 789 | 3.8 | 33.57 | |
| Blink ... | " ... | 23 April " | 542 | 4.0 | 24.28 | |
| Isabelle ... | " ... | 2 June " | 437 | 3.9 | 19.08 | |
| Lena ... | " ... | 17 June " | 583 | 3.7 | 24.15 | |
| Linnett ... | " ... | 19 June " | 761 | 3.8 | 32.35 | |
| Rosebud ... | " ... | 13 April " | 494 | 3.7 | 20.46 | |
| Ream ... | " ... | 26 June " | 459 | 3.6 | 18.5 | |
| Ream Routhie | " ... | 19 Sept. " | 248 | 3.7 | 10.27 | |
| Baroness ... | Jersey ... | 13 June " | 492 | 4.4 | 24.23 | |
| Content ... | " ... | 11 July " | 511 | 4.7 | 26.89 | |
| Effie ... | " ... | 10 Feb. " | 123 | 5.1 | 7.0 | |
| Eileen ... | " ... | 13 Aug. " | 687 | 4.1 | 31.53 | |
| Jersey Belle ... | " ... | 4 July " | 422 | 4.9 | 23.15 | |
| Stumpy ... | " ... | 1 July " | 736 | 4.5 | 37.09 | |
| Opale ... | " ... | 24 Feb. " | 81 | 5.1 | 4.62 | |
| Playful ... | " ... | 6 Aug. " | 521 | 3.9 | 22.74 | |
| Dairymaid ... | Holstein ... | 27 Feb. " | 327 | 3.2 | 11.71 | |
| Fancy ... | South Coast | 7 May " | 583 | 3.9 | 25.45 | |
| Misery ... | " ... | 4 May " | 482 | 3.2 | 17.27 | |
| Toughy ... | " ... | 1 Sept. " | 629 | 3.3 | 23.24 | |

Dried off 16-9-99

Dried off 12-9-99

THE DAIRY HERD—*continued.*RETURNS FROM 1ST SEPTEMBER TO 30TH SEPTEMBER, 1899—*continued.*

| Name of Cow. | Breed. | Date of Calving. | Yield. | Per cent. Butter Fat, Babcock Test. | Com- mercial Butter. | Remarks. |
|---------------|-----------------|------------------|--------|---|----------------------------|------------------|
| | | | Lb. | | Lb. | |
| Gertie ... | South Coast ... | 3 June, 1899 | 647 | 3.4 | 24.62 | |
| Biddy ... | " ... | 18 May " | 667 | 3.9 | 20.13 | |
| Ginger ... | " ... | 17 June " | 489 | 3.8 | 20.8 | |
| Lady ... | " ... | 6 April " | 475 | 3.8 | 21.21 | |
| Leopard ... | Grade ... | 23 Nov. " | 414 | 3.9 | 18.07 | |
| Lucy ... | " ... | — Oct., 1898 | 78 | 4.2 | 3.66 | Dried off 9-9-99 |
| Peggy ... | " ... | 14 July, 1899 | 485 | 3.8 | 20.64 | |
| Ranger ... | Grade Shorthorn | 9 June " | 582 | 3.9 | 25.41 | |
| Roany ... | " ... | 12 June " | 591 | 3.1 | 20.51 | |
| Stranger ... | " ... | 15 Aug. " | 798 | 3.8 | 33.95 | |
| Star ... | Grade ... | 17 Dec., 1898 | 533 | 3.6 | 21.48 | |
| Whiteflank... | " ... | 4 June, 1899 | 779 | 3.6 | 31.4 | |
| Empress ... | " ... | 23 Aug. " | 717 | 3.5 | 28.11 | |
| Rose ... | Grade Shorthorn | 11 Feb. " | 492 | 3.5 | 19.28 | |
| Sally ... | " ... | 23 Sept. " | 83 | 3.5 | 3.24 | |
| Painter ... | Shorthorn " | 4 Sept. " | 621 | 3.7 | 25.72 | With first calf |
| Brush ... | " ... | 12 Sept. " | 386 | 3.9 | 16.85 | " |
| Blossom ... | " ... | 14 Sept. " | 285 | 3.8 | 12.12 | " |
| Florrie ... | " ... | 15 Sept. " | 279 | 3.8 | 11.87 | " |
| Kit ... | " ... | 16 Sept. " | 281 | 3.6 | 11.32 | " |
| Kate ... | " ... | 30 Aug. " | 411 | 3.8 | 17.48 | " |
| Louisa ... | " ... | 4 May " | 78 | 4.3 | 3.75 | Dry, 10-10-99 |
| May ... | " ... | 26 May " | 483 | 3.8 | 20.55 | With first calf |
| Nestor ... | " ... | 27 Feb. " | 553 | 3.8 | 23.53 | " |
| Plover ... | " ... | 25 April " | 532 | 3.5 | 20.85 | " |
| Queenie ... | " ... | 20 April " | 482 | 3.7 | 19.94 | " |
| Pansy ... | Devon ... | 7 Oct., 1898 | 389 | 4.3 | 18.72 | " |
| Maggie ... | Shorthorn ... | 5 April, 1899 | 320 | 3.8 | 13.6 | |

NOTE—The cows during the last fortnight of the period covered by the foregoing report have not been hand-fed. They graze in the railway paddock during the day and home paddock at night.

The Horse.

STABLE NOTES.

By W. C. QUINNELL, M.R.C.V.S.

DISEASES OF HORSES.

INFLUENZA.

Causes.—This disease appears in all climes and at all periods of the year, but is more prevalent in the spring and autumn. It attacks animals of all ages, breeds, and sex.

Animals are predisposed to the disease by bad sanitary conditions, viz.:—Overcrowded stables and defective ventilation, insufficient supply of nutritious food; and to these and many other causes may be added the presence of the active agent—the specific organic poison—given off in the breath, &c., of already affected animals, which, when inhaled into the lungs or lodged on the mucous membrane of other horses, whose health is impaired, makes them, under these circumstances, suitable subjects to be attacked.

VARIETIES OF INFLUENZA.

1. *The usual simple catarrhal form.*
2. *Complicated forms are:* (a) Thoracic. (b) Abdominal. (c) Rheumatic.

GENERAL SYMPTOMS OF INFLUENZA.

Great prostration, with catarrhal inflammation of the respiratory and sometimes of the other mucous membranes, accompanied with fever, characterise all the varieties of influenza.

SYMPTOMS OF THE UNCOMPLICATED CATARRHAL FORM.

In the majority of cases the constitutional disturbance is slightly marked. The legs and ears are usually cold, and there may be, occasionally, a short irritable cough and sneezing. The throat is sometimes swollen, and tender to the touch. On taking the pulse, we find it feeble and frequent, and the thermometer indicates a variable elevation of temperature. These symptoms may remain much the same for two or three days; more often, however, they are followed by others of a more urgent nature. The temperature may rise to 105 or 106 degrees; the pulse may reach 60 to 80 beats to the minute, and the respirations become accelerated. The other symptoms also increase in severity: the cough becomes deeper and deeper, and more laboured, the throat swells considerably, and is very sore—so much so, that there is much difficulty in swallowing, and the horse refuses all food. The debility and prostration become more intense, and there is a marked thirst. The mucous membrane lining the nasal chambers at first dry become moistened, and there is a discharge of mucus. The bowels are sluggish, the fæces pale and scanty, the surface of the dung pellets is glazed, and, perhaps, coated with mucus. The urine is scanty and high-coloured, and often contains albumen.

Simple Catarrhal Influenza is often ushered in, and accompanied by running at the eyes, swelling of the eyelids and of the legs, and under the belly, and other symptoms denoting extreme debility. Even in the very early stage, the animal may be so reduced in strength as to require assistance to remove him into a loose box.

The indications to a favourable progress are marked by the symptoms gradually abating. The nasal discharge increases in amount, becoming thicker and purulent. The cough is moister and less frequent, and the temperature falls gradually; the urine being discharged more frequently, and in greater quantities, and not so highly coloured; and by the dung becoming of a proper consistency and soft, instead of being voided in hard, mucous-covered pellets. Convalescence is established in about 14 days from the onset of the fever.

When a case is going to terminate fatally, the general symptoms become more intense and complications set in, due to various other derangements. The membrane of the nostrils may become mulberry red, and in very bad cases the discharge may be streaked with blood. The pulse will be found to falter and sink, and, as a finale, cold sweats will break out. Death, as a rule, occurs about the sixth or seventh day, but it may be protracted to about the twelfth day.

Treatment.—The treatment of horses suffering from influenza must necessarily vary very much. In early stages, with care and nursing, the threatened attack may probably pass off in a few days.

General Treatment.—Isolate patient and use disinfectants. Promptly remove sick animal to a comfortable loose box with a temperature of 60 to 65 degrees Fahr., and proper attention paid to ventilation; plenty of pure air. Rugs, hood, and bandages to legs. Regulate superficial temperature. Maintain bowels in regular state with enemata, linseed mashes, and, if need be, with occasional laxatives. Febrile symptoms, combated with small doses of liquor ammon., acetatis, epsom salts, nitre. Restrict to mash diet, with a little green food; but when febrile symptoms abate, give digestible, concentrated, nutritive food.

Catarrhal Symptoms.—Treated by steaming heat, medicated inhalations or sprays. Hot fomentations, stimulating embrocations to throat. In cases where there is debility or prostration, the strength should be supported at once by the administration of stimulants, such as carbonate of ammonia, and camphor, and ginger, with ale and porter, nutritive gruels, &c. Where there is marked thirst, the animal should be frequently supplied with small quantities of fresh water containing salines, such as nitrate or chlorate of potash.

Before treating on the *Complicated Forms of Influenza*, we may mention a special form of catarrhal influenza, which has been treated of late years, termed "Pink Eye." By some persons it has been regarded as a distinct disease; but it is, in all probability, only a modified form of simple influenza. This malady is manifested by symptoms of a peculiarly marked nature. The conjunctival membrane (the membrane covering the eye) is of peculiar pinkish colour, and this is accompanied by a swollen state of the conjunctive. The constitutional symptoms are very severe, and the temperature may rise to 105 or 106, or even 107 degrees. Sometimes severe pneumonic symptoms develop, when large portions of one or both lungs become implicated. Violent diarrhœa, colicky pains, and other enteric symptoms may also supervene. In some cases there is partial or total loss of power in the hindquarters.

When occurring in strong horses, Pink Eye is usually a mild affection, but, when attacking animals in a low condition, it is more serious. The more the internal organs (as the lungs, the intestines, and heart) are involved so much more dangerous is the malady. It may be mentioned that in this particular form of influenza there is a remarkable tendency towards the formation of fibrinous clots (thrombi) in the cavities of the heart and in the larger arteries, especially in the pulmonary (lung) system. From this disposition to the formation of thrombi are attributed to account for the occasional sudden termination of the disease by death, which frequently occurs in a marked and unexpected manner.

The treatment of Pink Eye, like other forms of influenza, must consist primarily in good nursing, a comfortable, cool, well-ventilated horse-box, warm clothing, and such dietetic and general treatment as has been already given.

A CURE FOR GREASY HEELS.

A CORRESPONDENT of the *National Stockman* gives his experiences of greasy heels in horses. He writes:—"During the winter of 1879 and 1880 I had occasion to use four horses constantly on the road. They soon had the scratches. I tried all the usual simple remedies—such as dish water, salt water, and copperas water—but without any effect, as I could not get to keep them in the stable long enough to do any good. The scratches soon took the worst form of greasy heels, with bleeding sores and ulcers, which in one case extended clear up the legs and over the belly. I was in despair. To take the teams off the road I could not afford, and to use them in the condition they were in was cruel; but at that juncture I chanced at a neighbour's to pick up an old 'Farrier's Book,' as it was entitled, and saw therein the heading as above given. The conditions were:—Dissolve a box or ball of concentrated lye or potash in hot water, making as strong a solution as possible. Bottle this solution when cool, and use by diluting 1 wineglassful of the solution in 2 gallons of cold soft water, and bathe the affected parts thoroughly with the dilution. Apply with a rag or sponge for at least 15 minutes to each horse. Do this twice a day, morning and evening, and you may use the horse every day, and he will get well. I followed the instructions, and the results were really wonderful, and my horses were soon well. I have seen the legs of horses wiped perfectly dry immediately after applying the remedy, and within 10 minutes the legs would be in a profuse sweat."

THE HACKNEY.

A CARRIAGE-HORSE SIRE.

THE accompanying figure shows an outline drawing of a stallion of the hackney type, such as has been used in this country for several years among reputable farmers. It will be seen that the hackney possesses all the desirable points of the typical carriage horse. He has a nicely shaped head; pleasant expression; naturally arched neck; powerful, sloping shoulders; wide chest; smoothly rounded

barrel; lever back, not too long; tail well set up; nicely-rounded hindquarters; well-muscled thighs and arms; short, stout legs with good flat bone below the knee and hock; pasterns of correct shape and slope; shapely feet; straight front legs that stand firmly, and thus support the fore end of the body; well-formed hind legs that are so placed as to support the hindquarter—the one well forward under the body, and the other in direct line with the buttock—both, looked at from behind, being straight, and not spreading apart. The whole body of the horse is in true proportions, and shows perfection of symmetry, so that, whether at the walk or trot, the horse can be counted upon to move with regularity and precision, making no false steps, and having one hind leg always underneath him while his front legs are acting high.

STYLE AND ACTION.

The hackney type is admitted to be the correct one where ability to draw weight without undue exertion is necessary. A light, long, and narrow trotting-bred horse or thoroughbred uses up too much nervous or muscular energy when he is asked to pull anything heavier than the featherweight buggy. The hackney is a combination of the light and heavy horse. He has substance enough not to overstrain his muscular energy, and energy sufficient to make full use of his substance. This is the reason why one large or two small hackneys look so well in action in front of a brougham or other heavy carriage. The vehicle seems to roll along smoothly, while the horses trot in the height of style and pull the weight without apparent effort. This easy and regular action is the quality which adds value to harness horses, and which makes them sell well and quickly. Action, true and high, is what the hackney has always been famous for. He has been bred for it through many generations. It is in his blood, and when a hackney mare and her foal are allowed out of their box for the first time the foal will be seen to trot alongside of its dam, whereas a thoroughbred foal will lope or canter. This is why it is only necessary for breeders to send such mares as have some action to hackney stallions when they desire to produce foals that are to be trained for stylish harness. Turn a hackney-bred horse loose in the field, and he will immediately throw up his knees almost to his chin. Turn a speedy horse out, and he will sweep close to the ground. It is natural for the hackney-bred horse to lift his knees, and this is why breeders show them to halter at exhibitions, so as to prove that they can act high without being bitted and checked up in harness. Breeders who try to pass off speedily trotting-bred or thoroughbred horses as high actors invariably show them in harness and at a high rate of speed, because when such horses go slow they lose their action.

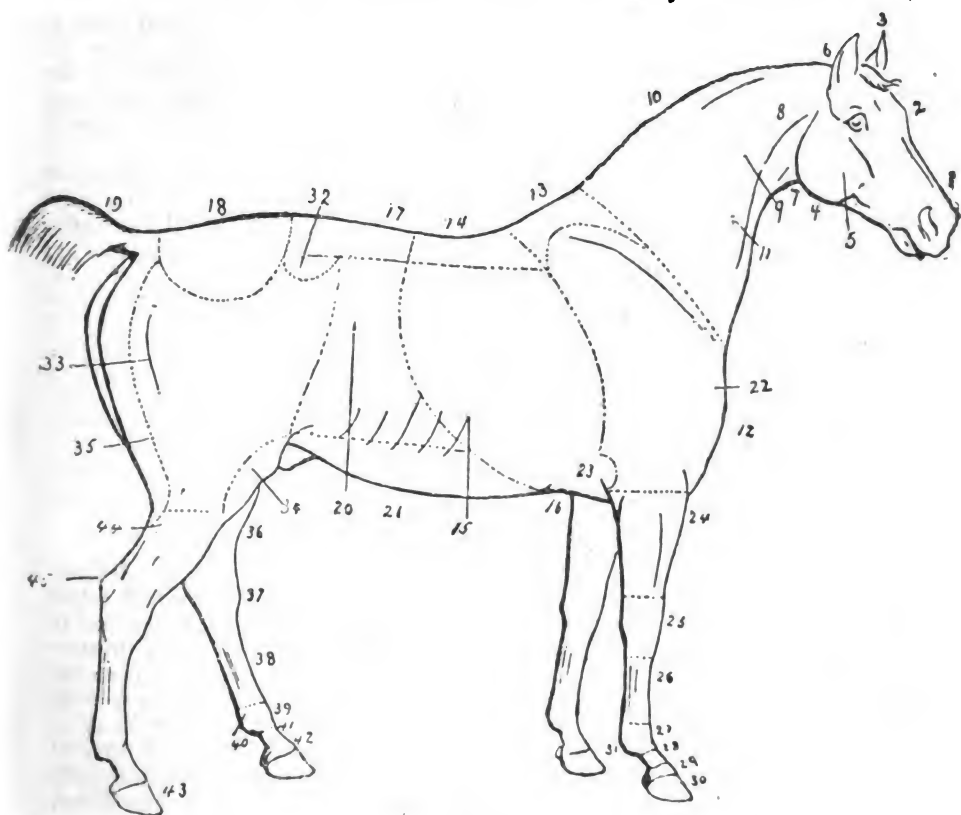
CAN ONLY TROT.

The action of the hackney is free, and from the shoulder. The feet, while being lifted high, are sent outwards—not propped straight up and down. The hind legs are at the same time shot well forward, and the hocks flexed to support the body and send it forward. It is this kind of action that lasts, and that is safe on stones or asphalt pavement, a horse with such action always being well balanced and prepared to recover should he slip. Horses that pump their knees up and down, and leave their hocks behind them, soon pound their front legs to pieces, and never have a hind leg under them far enough to prevent a fall. A horse with good hind action pulls more weight up a hill, and is infinitely safer going down a hill than a horse with poor action. The hackney, having been for many generations made to pull heavy vehicles, and go at an even pace, and reined in so as to make it throw its knees up and trot at a regular one, two, three, four pace, has become a natural high actor. The American trotter, on the contrary, has, for 100 years, been bred for speed, and taught to lower its action so as to waste no time. It has also been bred for long hindquarters, and taught to carry its hind legs forward with a swing, so as to cover a great distance at each stride. If you push a trotting-bred horse beyond its speed, it breaks into a canter or gallop. If you push a hackney-bred horse beyond its speed, it merely lowers its action, but does not break its trot, for the reason that it has never been taught to do anything except the trot. Its

action, even at the lowest, will still be higher and more regular than the slow action of the trotter or thoroughbred, and, as it will always clear the ground, it must be safer. The hackney-bred horse will never spread its hind legs, and whether it goes fast or slow will act in true rhythm, putting the hind feet in the spot where the front feet are taken from.

OTHER GOOD POINTS.

The soundness of the hackney as a breed has always been one of its chief characteristics. It is only gradually trained to harness up to its third or fourth year, so that its wind is not ruined, or its legs and muscles overstrained before maturity. At four years old the hackney must, then, be better constitutionally than the trained trotter or thoroughbred, which from two years old is compelled to compete in races. Never being asked to draw extraordinary weight, nor to travel quicker than 8, 10, or 12 miles an hour, it stands to sense that a hackney must be in healthy condition, and is, therefore, able to get or produce healthy offspring. Under these conditions, it is not wonderful to find that the hackney is the most tractable of all horses as a race. It is easily handled and broken,



SCALE

- | | | | |
|--------------------------------|-----------------------|------------------------|------------------------|
| 1. Face. | 12. Breast. | 24. Forearm. | 36. Leg. |
| 2. Forehead. | 13. Withers. | 25. Kneep. | 37. Hock. |
| 3. Ears. | 14. Back. | 26. Canon or shank. | 38. Canon or shank. |
| 4. Lower jaw. | 15. Ribs. | 27. Fetlock joint. | 39. Fetlock joint. |
| 5. Cheek. | 16. Girth. | 28. Pastern. | 40. Ergot and fetlock. |
| 6. Poll. | 17. Loins. | 29. Coronet. | 41. Pastern. |
| 7. Throat. | 18. Croup. | 30. Foot. | 42. Coronet. |
| 8. Paratid. | 19. Dock. | 31. Ergot and fetlock. | 43. Foot. |
| 9. Neck. | 20. Flank. | 32. Haunch. | 44. Lower thigh. |
| 10. Crest. | 21. Belly. | 33. Thigh. | 45. Point of hock. |
| 11. Jugular Channe' or furrow. | 22. Point of Shoulder | 34. Stifle. | |
| | 23. Elbow. | 35. Buttock | |

comes to the call, takes naturally to harness, because its progenitors have been used for scarce anything else, and a colt used for light work alongside of its dam on the farm will almost break itself sufficient to admit of its being sold as fairly tractable and mannerly without extra preparation, as it approaches its fourth year. It, therefore, costs very little, if anything, for a farmer to get his hackney-bred colts ready for the dealer when he comes to make his purchases.

The hackney has been ridiculed in this country as simply being a "show" horse, because exhibitors have over-advertised him as such. If a gentleman in town has one or more beautiful, high-stepping horses, he likes to keep them always in high condition for the show ring or the fashionable promenade. To ask such a horse to perform long journeys would be obviously unfair, as he is not in condition for it. The untrained trotter or thoroughbred racehorse would make a much worse showing on the track than the untrained hackney would on a long journey. A hackney kept in good hard condition for work on country roads will pull a heavy trap with two or more passengers in it, and keep up a regular 10, 12, or 14 mile-an-hour gait for hours; and given proper training, can be made to do similar feats to those for which his ancestors were famous, such as "17 miles in 56 minutes, carrying 182 lb."; "30 miles to market and 30 back again, pulling a heavy cart containing a fat farmer and baskets filled with merchandise"; 1 mile in 3 minutes, carrying 196 lb.," &c. The necessity for such endurance and work has long since disappeared, and the habit being disused, has become dormant; but endurance is not necessarily eradicated from the blood.

The drawing shows a stallion with shortened or "docked" tail. Many of the young stallions that are to be turned over to farmers will not be "docked," but will be allowed to retain their full tails, so that the horses will not suffer from flies and other insects, and so shall not fret and lose flesh when turned out to graze.—*Rural New Yorker*.

The Orchard.

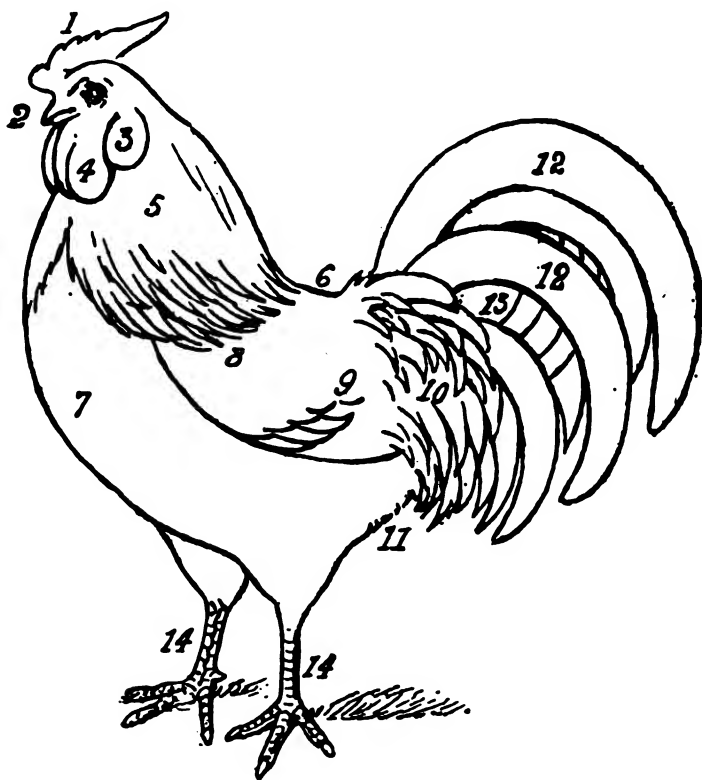
THE FRUIT FLY.

As the season for summer fruits is now approaching, the attention of all fruit-growers is called to the importance of, or rather necessity for, concerted action to prevent such fruits being destroyed by the fruit fly. If fruitgrowers are to obtain any benefit from the coming crop, it is essential that they should do their utmost to keep the fruit fly in check. The fly has already made its appearance this spring, and unless strenuous efforts are made to keep it in check there is every probability that it will destroy a great part of the summer fruit crop. Such a loss can, however, be greatly minimised if the gathering and destruction of all infested fruit, particularly so early in the season, be thoroughly and systematically carried out, not only by those who make their living, or a part of their living, by fruit culture, but by everyone who has a fruit tree or trees in his garden. All infested fruit should be destroyed by boiling, the boiled fruit being fed to poultry or pigs. Boiling is preferable to, and more efficacious than, burying. All worthless seedling peaches, guavas, or other fruits growing on the banks of creeks, along roadsides, or in abandoned orchards, should be destroyed, as they are of no value to anyone, but are actually a public nuisance, as they are a constant menace to adjacent orchards, and a regular breeding-ground for the fly.

Poultry.

POINTS OF A FOWL.

ALTHOUGH the points of the fowl are well known to all poultry fanciers, there are a vast number of people more or less interested in fowls who are ignorant



of the technical terms applied both to the anatomy as well as to the plumage of the bird. The accompanying diagram indicates the chief points and their position, and, in order to obviate difficulties as to the particular breed of the index cock, it may be mentioned that it belongs to no particular class, but is rather a conglomeration of all the recognised varieties. The numerals signify:—1, comb; 2, face; 3, deaf ear; 4, wattle; 5, hackle; 6, back; 7, breast; 8, wing bow; 9, wing bar; 10, tail coverts; 11, fluff; 12, sickle feathers; 13, tail; 14, shanks.—*Farmer and Stock Breeder.*

Viticulture.

QUEENSLAND INDIGENOUS SPECIES OF *VITIS* AS A STOCK FOR THE GRAPE VINE.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

THE grafting of the varieties of *Vitis vinifera* upon American species has been in practice for many years, and has been found advantageous in many respects. But with regard to using the Australian species of the genus, it must be borne in mind that these all belong to the sub-genus *Cissus*, and differ considerably from the *Euvitis*, which, in addition to the common grape, includes many American species, some of which, besides being used as stocks upon which to graft others, have been brought to a high state of perfection by selection, cultivation, and cross-fertilisation. Our indigenous species of *Vitis* stand in a similar position to *Euvitis* as does the sub-genus *Ampelopsis*, of which there are American species, but it is not with species of these sub-genus that the Americans have experimented. Had they done so, we might, when advocating that our plants be experimented with, refer to their work. What I want to point out is that all the American experiments have been with species more or less closely allied to the common grape, while we, in taking our species in hand, have to deal with plants of almost a distinct genus; therefore we have a much more difficult task before us.

The number of species of *Vitis* belonging to Queensland is about twenty, and these vary much in the size of both berry and bunch. Some record having gathered bunches 2 lb. in weight. Some of the species are gigantic climbers, while others form but rambling shrubs with hairy, prickly stems. They are met with throughout the length and breadth of the colony, and several form large yam-like underground stems. If we undertake to utilise these for fruit we must first collect seeds of all the most likely species to serve the purpose, selecting only the finest berries; carefully cultivate the plants thus obtained; carry on a system of cross-fertilisation with the indigenous kinds, then with the American, and ultimately with the common grape. This must be the aim of the cultivator, but it must be borne in mind that as the plants to be operated with are not closely related, the success of the experiments may not be all that one could desire, so far as the cross-fertilisation with the species of *Euvitis* is concerned. Work of this character requires great patience and thoughtfulness, and should be in the hands of one not easily disheartened by failures. For over thirty years I have advocated a trial being made in using some of the indigenous varieties of *Vitis* as stocks for the grape vine—but only as an experiment, for I do not expect, even if a union should take place between scion and stock, to find them as suitable for the purpose as the American species.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S.,
Colonial Botanist.

Order SAPINDACEÆ.

CUPANIA, Linn.

C. curvidentata, *Bail.* (n. sp.) A small tree, not, so far as known, attaining a height of more than 20 ft. Leaves about $1\frac{1}{2}$ ft. long, pinnate, with alternate leaflets. Petiole stout, almost terete, about 3 in. long, petiolules 1 to $1\frac{1}{2}$ in. long, slender; leaflets about 20, oblong-lanceolate to 6 in. long and 2 in. broad, coriaceous, bordered by rather large, blunt, incurved teeth, acuminate at the apex, cuneate and more or less unequal-sided at the base, upperside smooth, the veins showing but slightly, the numerous parallel nerves and reticulate transverse veins very prominent on the underside; the petiole and rhachis dark-coloured and closely dotted with small light-coloured lenticella. Panicles puberulous, erect, narrow, about 11 in. long, with a few racemose branches below the middle. Flowers in small clusters, nearly or quite sessile; sepals 5, dark-purple, the colour concealed on the outer side by the hairy surface, nearly orbicular, about 2 lines long. Petals yellowish, wavy, about half as long as the sepals. The scales at their base very wavy and hairy. Stamens 8, the short filaments hairy at the base. Ovary ferruginous, hairy, 3-lobed; stigma coloured. No fruit to hand.

Hab.: Stony Creek, near Cairns, *L. J. Nugent*.

Order MYRTACEÆ.

EUGENIA, Linn.

E. Hislopii, *Bail.* (After R. Hislop.) Aboriginal name, "Walkaran." A tree of about 30 ft. in height, and a trunk diameter at base of 15 in.; branchlets rather crowded, slender. Leaves oblong-lanceolate, about $2\frac{1}{2}$ in. long, and $\frac{3}{4}$ to 1 in. broad; the apex more or less elongated, but blunt, tapering considerably to a petiole of about $\frac{1}{2}$ in. long, upperside glossy, underside somewhat brownish; primary nerves rather distant, looping far within the margin, transverse reticulate veins prominent, oil dots copious. Flowers in short, stout, dichotomously branched panicles $1\frac{1}{2}$ in. long, on the trunk of the tree from near the base to the height of about 10 ft.; the flowers usually in pairs at the ends of the branches of the panicle, closely sessile, or by the elongation of the branch appearing pedicellate. Calyx-tube white, campanulate, about 5 lines long, longitudinally corrugated; lobes short, broad, rounded. Petals white, twice or more as long as the calyx-lobes, rotundate and much imbricate. Stamens 6 to 8 lines long, the inner ones smaller. Anthers oblong, about 1 line long. Fruit ovoid, $3\frac{1}{2}$ in. long, $2\frac{1}{2}$ in. broad, white with a pink blush, very soft, and very succulent.

Hab.: The tree does not grow, so far as at present known, at a lower altitude than 1,500 ft. —*R. Hislop* (Roth).

Order LILIACEÆ.

NOTHOSCORDUM, Kunth.

[From *nothos*, spurious; and *scordon*, garlic.]

(Plate CLI.; 2 segments and 2 filaments have been removed from the figure of open flower.)

Perianth withering, persistent; segments 6, connate at the base or to the middle, the other portion patent or campanulate-connivent, subequal, 1-nerved. Stamens 6, fixed to the base of the segments, filaments dilated, subulate at the apex. Anthers oblong dorsiflexed, dehiscence introrse. Ovary sessile, 3-celled; style filiform, often persistent; stigma small, ovules in cells numerous. Capsule membranous, 3-dym. or 3-lobed, cells dehiscent. Seeds angular-compressed or nearly flat, black. Leaves radical, linear, flat. Scape simple, not leafy. Flowers umbellate, not articulate with the pedicels. Involucral bracts 2. The garlic scent wanting in the genus.—*Benth. and Hook.* Gen. Pl. iii. 802.

N. fragrans, Kunth.; *Allium fragrans*, Vent. (Bot. Reg. 898.) Flowers whitish, with brownish-purple or lilac streak on the outside of each segment, very fragrant. Umbel lax, 6 to 20-flowered. Leaves all radical, narrow-lorate. Scape 1 to 2 ft. high.

Hab.: North America; become naturalised near Bundaberg, *J. Keys*; and likely to become a pest, as besides its bulbs it produces an abundant quantity of seed; otherwise it is a pretty plant for the garden, flowering through the summer months.

Order LICHENES.

The following Lichens have been determined, and the fresh species described, by the eminent Scotch Lichenologist, Dr. James Stirton, of Glasgow. The examples for the most part were collected some years ago by Mr. C. J. Gwyther in the neighbourhood of Warwick. The Doctor says—

"While the collection is a fairly representative one of the Queensland Lichen Flora, there are one or two, which show peculiarities of the internal organisation of the *Apothecia*, that scarcely find a parallel in any that have come under my observation.

"As usual, the crustaceous *Lecideæ* with fuscous 1-septate spores largely prevail, and manifest variations of structure which are very puzzling and even perplexing. Such differences I am bound meanwhile to describe. The progress of investigations in this section of the *Lecideæ* will doubtless serve to elucidate these peculiarities, and to allocate to them their due place in classification, as well as to confirm or negative their significance.

"In the first place there are two species of the genus *Collema*—one of which forms part of the present collection, the other is from a former collection of lichens sent in 1877 by Mr. Bailey."

Collema hypolasium, Strn. Similar to *C. reflectans*, Nyl., Syn. L. N. Caled. p. 4, but obscure, and the epithallus not cellulose, and beneath the thallus densely and closely tomentose or velvety. Spores 8, in saccate thecae, ellipsoid, simple, haloniate, .016—02 × .0075—01 mm. On bark; Bailey, No. 30.

The thalline excele of the apothecium is covered by a cellular layer composed of largish round cells, although the upper surface of general thallus is non-cellular.

Collema Gwytheri, Strn. Thallus obscurely olivaceous or nigro-virescent, appressed, membranous, lobate, with ascending lobules, margins somewhat crisp and crenate; beneath atmost concolorous and nude. Apothecia brownish-red, flat, with a thin entire thalline ring. Spores 8, colourless, almost cylindrical or arcuate, 7-10 usually 8-nucleate. Epispore scarcely visible, .025—035 × about .003 mm. Hym. with iodine carulescent. Gonimia concatenate small on branches of trees.

Plate CLI.



NOTHOSCORDUM FRAGRANS. Google

The spores are well-developed, and are very peculiar, almost anomalous. They are distinct in outline, but there is no definite episore. The nuclei or sporules, as they must be called, are merely embedded in a clear hyaline gelatine, which, however, retains its cylindrical as well as its curved shape, even under considerable pressure. The sporules refract light strongly.

The specimen in possession is small; only about half an inch in diameter.

Collema byrsinum, *Ach.*

Leptogium tremelloides, *Fr.*

Leptogium phyllo carpum, var. *isidiosum*, *Nyl.*

Calicium quercinum, var. *lenticulare*, *Ach.*

Thysanothecium Hookeri, *Berk.* and *Mnt.*

Cladonia cariosa, *Flk.*

Cladonia fimbriata, var. *chordalis*, *Flk.* = var. *subcornuta*, *Nyl.*, and var. *fibula*, *Hffm.*

Cladonia aggregata, *Eschw.*

Heterodea Mulleri, *Nyl.*

Usnea ceratina, *Ach.*

Usnea subclurida, *Strn.*; Scot. Nat. 1881.

Usnea longissima, *Ach.*

Ramalina inflata, *Hook.*

Ramalina fraxinea, *Fr.?*; barren.

Ramalina Ecklonii, var. *ovalis*, *Tayl.*

Stictina quercizans, *Ach.*

Sticta pulmonacea, *Ach.*

Ricasolia erosa, *Eschw.* = *R. stenospora*, *Nyl.*

Ravenelii = *R. Ravenelii*, *Tuck.*

Parmelia caperatula, *Nyl.*

Parmelia perforata, *Ach.*

Parmelia cetrarioides, *Del.*

Parmelia tinctorum, *Despr.*

Parmelia tiliacea, *Ach.*

Parmelia tiliacea, var. *affixa*, *Strn.*

In such a climate as that of Queensland the white colour of plants exposed to sunlight can scarcely remain long as such, but must soon assume a yellowish tint. Even in the case of the specimens of the present collection referred to. *P. tiliacea*, the thallus has a deeper coloration than in those from Europe, but in them the red reaction by C. on the medulla is abundantly manifest, while not a trace of red by the same reagent is seen in *P. hypoxantha*, *Strn.*, described below. The spores also of the two specimens of *P. tiliacea* are much more nearly spherical than in European samples. As one of the Queensland specimens has the thallus closely appressed to the bark, I have named it var. *affixa*. Having stated so much, the matter must lie in abeyance meanwhile, until a more extended series of specimens shall have been obtained.

Parmelia laceratula, *Nyl.*

There are several examples of this lichen in the collection, in all of which the thallus is "pallide ochraceus vel lutescenti-pallidus," and not "albidus vel albo-glauescens," as stated by Nylander in his Syn. Meth. Lich. p. 390. All this bears out what is stated in the preceding paragraph. No. 332 contains specimens with shorter at times nearly spherical spores thus, '008 — '011 × '007 — '009 mm., but in the absence of spermatia I cannot reconcile myself to the separation of this from *P. laceratula*.

Parmelia hypoxantha, *Strn.* Thallus pale-yellowish or whitish (K yellow), usually orbicular, medium rough, laciniate, with small imbricate laciniae, margins crenulate and sinuose-lobate, bluish-black, shortly and sparingly covered with black fibrils. Medulla white (K-C-). Apothecia brown, 2-4 mm. wide, flat margins often crenulate. Spores 8, colourless, simple, broadly ellipsoid, $009 - 012 \times 007 - 009$ mm.; paraphyses not easily separable, apices rufo-fuscescent, hypothecium colourless. On bark.

The lower surface of the medulla (exposed after the black hypothallus is peeled off) is almost always seen yellow or orange-yellow, and K gives, on this surface, a yellow then red reaction.

This *Parmelia* is certainly closely allied to *P. subtiliacea* (Nyl. Lich. N.Z., 1889, p. 26), but the spores in five different samples examined are as given above; while those of *P. subtiliacea* are $014 - 017 \times 007 - 008$ mm., and the thallus "albidus." Krempelhuber describes (Novara Exp. p. 114) a *Parmelia* under the name *P. Jelinekii*, which is also allied to the present one. Its thallus is "ochroleucus," and the sub-medullary stratum is "late aureum," but the spores are exactly as given above under *P. subtiliacea*, perhaps a little longer.

Parmelia limbata, *Laur.*

Parmelia physodes, *Ach.*

Parmelia placorhodioides, *Nyl.*

Parmelia encausta, *Ach.*

Physcia chrysophthalma, *DC.*

Do. do., var. *Sieberi*, *Laur.*

Physcia leucomela, *Mich.*

Physcia speciosa, *Fr.*

Do. do., var. *soredioides*.

Physcia stellaris, var. *acrita*, *Ach.*

Do. do., var. *radiata*, *Ach.*

Pyxine picta, *Sw.*

Pyxine confluens, *Fr.*

Pyxine Meissnerii, *Tuck.*

Pannaria elatior, *Strn.* Thallus broadly foliaceous, pallid, testaceous, often orbicular, epithallus minutely granulose or leprose, particularly towards the margin, laciniate, laciniae incised and albo-sorediate along the margin, beneath pale fawn-coloured or whitish, covered with long white or occasionally blackish fibrils. Apothecia reddish-brown, flat, girded with a white, rather prominent, radiate-rugose thalline margin, spores 8, in one series, colourless, ellipsoid or fusiform-ellipsoid, $015 - 019$ and $008 - 01$ mm.; paraphyses separable, medium; hypothecium colourless, with iodine caeruleous. Strathbrook, near Warwick, *C. J. Gwyther*; Killarney, *Bailey*. On old logs.

Pannaria terrestris, *Strn.* Thallus pallid or pale-green, thin, squamose, of small appressed scales of about 3 mm., margins crenate, the lobes crowded or distinct; gonimia bluish, small, $003 - 005$ mm., in large oblong heaps, with distinct margins, width to 08 mm. Apothecia medium, lecanorine, sessile, brownish-red, margin pale, with a prominent finally crenulate margin, spores 8, colourless, simple, ellipsoid or broadly ellipsoid, $012 - 016 \times 007 - 009$ mm.; paraphyses medium, fairly discrete, with clavate conglutinate red and brown apices; hypothecium yellowish-red or almost colourless; hymenial jelly, with iodine bluish, then wine-yellow or reddish. On bare earth.

This lichen is somewhat anomalous. I cannot recall any *Pannaria* having gonimia (which are of a brilliant blue) contained in such large distinct membranes. These glomeruli vary from 01 to 08 mm. long, and may contain hundreds of gonimia. Dr. Nylander has constituted a new genus or subgenus of *Lecanora* under the name of *Lecanorina*, whose thallus contains gonimia

instead of gonidia, but no mention is made of conglomerate gonimia. It might be as well to give expression to these differences by constituting a new sub-genus under the name of *Glomeraria*.

Coccocarpa molybdæa, Pers.

Placidium clavigerum, Strn. Thallus pallid or pale-yellowish, appressed, the centre scaly, the circumference shortly lacinate (K. purple); apothecia brown or yellow-brown (K. purp.), lecanorine, flat or sub-convex, medium; spores 8, colourless, oblong or oblong-fusiform, polari-bilocular, $\cdot009 - \cdot013 \times \cdot004 - \cdot005$ mm.; paraphyses discrete, with colourless apices, clavate and articulate, the club-shaped tips $\cdot004 - \cdot005$ mm. wide; hypothecium colourless. Hym. with iodine bluish; gonidia large $\cdot009 - \cdot02$ mm. broad. On bark.

Lecanora subpurpurea, Strn. Thallus pale-yellowish or testaceous, rather rough (K. C. golden-yellow); apothecia black, sessile, within wholly purplish-violet, margin pale and roughish; spores 8, simple, broadly ellipsoid, $\cdot008 - \cdot011 \times \cdot006 - \cdot007$ mm.; paraphyses thick (breadth $\cdot004 - \cdot005$ mm.); apices scarcely clavate; hypothecium colourless. On bark.

Lecanora phæoplaca, Strn. Thallus ashy-pale, rough or granulose, rimose-diffract (K. C.); apothecia, sessile medium, width 1.2 mm. or less, brown, flat, with a pale entire or crenulate thalline margin; thecae spored; spore colourless, ellipsoid or oblong-ellipsoid, 5-septate, rarely 5-7 locula, with thick hyaline walls, $\cdot03 - \cdot09 \times \cdot022 - \cdot03$ mm.; paraphyses slender, discrete, with brown granulate apices; hypothecium colourless, blue with iodine. On bark. In the pale border are numerous small cells, $\cdot006 - \cdot01$ mm. wide, which appear as leptogonidia, often clustered, of *Lecanora atra*. As I have only one other apothecium left, I do not care meanwhile to destroy it in order to obtain a more precise knowledge of the paraphyses, which appear as distinct broad rods or blocks—a very unusual occurrence.

Pertusaria multipuncta, Turn.

Lecidea luteola, var. condensens, Nyl.

Lecidea millegrana, Thyl.

Lecidea vinicolor, Strn. Thallus pale, yellowish or pallid, thin, shining; apothecia black, sessile, flat, obscurely margined, medium; spores 4-8, colourless, straight, rod-like, below attenuate, 7-12 septate, $\cdot04 - \cdot06 \times \cdot0035$ mm.; paraphyses separable, apices adherent, blue-black; hypothecium intensely red or wine-red, thick. The hym. with iodine first intensely blue, then wine-yellow. On bark. K renders the hypothecium somewhat purpurecent. The colour of this hypothecium is exactly that often produced by iodine on the hymenium, and which is called wine-red, but perhaps rubricose better indicates the colour. This is also a somewhat peculiar lichen.

Lecidea glomerella, Strn. Thallus whitish or ashy-pale, fractured into small plates (K yellowish). Apothecia black, sessile, width $\cdot5-1$ mm.; often crowded or appressed and then irregular; at first marginate, then depressed; spores 8, brown, 1-septate, ellipsoid or somewhat fusiform-ellipsoid, $\cdot012 - \cdot017 \times \cdot0065 - \cdot008$ mm.; paraphyses distinct, slender, with brownish or almost colourless club-shaped apices; hypothecium brown or blackish-brown, thick. Hymenium with iodine intensely blue. On bark. The hypothecium is thick and carbonaceous, and often breaks off from the rest, leaving a thinish fuscous portion attached to the paraphyses. In this lichen the reaction by K on the thallus is that of *L. disciformis*, but the spores are much smaller, &c.

Lecidea placomorpha, Strn. Thallus pale glaucous or whitish, thin, fractured into small plates (K yellowish, finally red); apothecia black, sessile, small, with black margin; spores 8, brown, ellipsoid, 1-septate, $\cdot115 - \cdot02 \times \cdot007 - \cdot009$ mm.; paraphyses medium, fairly distinct, with brownish clavate apices; hypothecium brown, thin, subtended by a thick black mass. On bark.

I have separated this from *L. disciformis* owing to the smaller spores and the reactions by K on the thallus. It is true that Nylander, in his Syn. L. N. Caled. p. 52, gives the reactions of *L. disciformis* as above, but in no instance.

European or elsewhere, have I seen such reactions, but merely K yellow. Leighton describes two British Lecideæ under the names *L. subdisciformis* and *L. ryssolea*, in which the thalli are rendered yellow, then red by K, but in both the margins of the apothecia are of a pale colour. Again, under the name *L. subdisciformis*, var. *microsperma*, Nylander (Syn. Lich. N. Caled. p. 52) gives another, the reactions of the thallus of which are presumably yellow, then red; but the spores are only half the length of those of the present lichen.

There is, in the same packet as the above, another Lecideæ whose thallus gives a still more pronounced after-reaction, viz. :—

Lecidea sanguinolenta, *Strn.* Thallus whitish or bluish-white, thin (K yellow, then red); spores 8, brown, ellipsoid, straight, 1-septate, $011 - 014 \times 0055 - 007$ mm.; paraphyses slender, distinct, with brown clavate apices; hypothecium brown-black, thickish. Epithecium and hypothecium with K rubescent.

K develops on the fuscous epithecium, but more especially on the hypothecium, a reddish purpurascens colour with abundance of reddish acicular crystals arranged in stellate groups. In a short time the whole field of the microscope is thickly covered with these groups. This seems a common lichen throughout Australia.

Lecidea nodulosa, *Strn.* Thallus thin, pale or reddish-pale, rimulose with a black border (K-C-); apothecia black, somewhat coated with a bluish bloom, innate-sessile, flat, width 5.1 mm.; with acute and prominent margins; spores 8, oblong-ellipsoid, colourless, irregularly 4-locular or irregularly 3-6 locular, $011 - 014 \times 006 - 0077$ mm.; paraphyses medium, fairly discrete, with black clavate apices; hypothecium black, rather thick; hymenium with iodine intensely blue. On rocks.

The particles contained in the spores are rendered even more distinct by K instead of disappearing by it. Accordingly this *Lecidea* must be reckoned near *L. postuma*, Nyl., and not classified under those of which *L. configua* may be said to be the type.

Graphis subvelata, *Strn.* Similar to *G. intricata*, Eschw., but apothecia rather prominent, nude not velate, and with rather large spores; spores (2-4-6-8?) colourless, oblong-ellipsoid, $02 - 03 \times 008 - 009$ mm.; 5-7 locular, the loculi once or twice divided; hypothecium colourless; paraphyses thickish, with brown-black clavate apices. Hymenium with iodine scarcely tinted or slightly yellowish red, the spores themselves reddish. On bark.

The varying number of spores in the thecæ is rather singular. Often 2 or 4, rarely 6, but, so far as observed, never 8 are seen in each thecæ. This lichen seems to play between *G. sophistica* and *G. intricata*.

Arthonia albobarinosa, *Strn.* Thallus white farinose, thin (K-C); apothecia at first clothed by the thallus, then breaking through rounded or somewhat irregular, small, width to 3 mm.; spores 4-8, colourless, obtusely fusiform, 4-6 septate, usually 5-septate, $018 - 027 \times 003 - 035$ mm.; paraphyses scarcely any properly so-called, irregular, apices brownish-black, thick, conglutinate; hypothecium black-brown. Hymenium with iodine faintly blue, then intensely red. Thecæ oblong or oblong-ellipsoid, with hyaline walls not so thick as usual. On bark.

The lower part of hypothecium is apt to break off, leaving a fuscous thinnish part attached to the paraphyses. The walls of the thecæ are tough and not easily ruptured. I scarcely know how to classify this lichen, as it is so unlike the rest of the tribe. It partakes of characters common to *Arthonia* and *Platygrapha*.

Verrucaria fibrata, *Strn.* Thallus maculate, lutescent, shining; apothecia black, prominent, small, width about 2 mm.; parathecium entire, black, beneath somewhat flat and thin; spores 8, 1-seriate, colourless, finally brownish, ellipsoid, often at both ends apiculate, 4-locular, with large equal locule, the apical one small; $014 - 018 \times 007 - 01$ mm.; paraphyses distinct, thickish. Hymenium with iodine not tinted. On bark.

Endocarpon Baileyi, *Strn.*

Horticulture

THE CAUSE OF DECAY IN PLANTS, AND THE REMEDY TO GIVE TO THEM NEW LIFE.

By R. R. HARDING,
Curator Botanic Gardens, Toowoomba.

THE primary object of this paper is to direct attention to the results of unskilful planting of trees. I will endeavour to show that this is very expensive, and unsatisfactory in the end. When we consider that it takes only a little time longer to plant trees properly, the only excuse that can be given for not doing so is that the persons who plant trees or shrubs are afraid to separate the roots for fear of killing the plant. It would be, as a matter of fact, much better to kill it then than to be disappointed in after years. Such cases are numerous in this town, and I am often asked by residents here, and by others in different parts of the colony, what is the reason for their trees looking so miserable?

Before I give a practical illustration of this I will go back to the heading of this paper: "The Cause of Decay in Plants." Decay or disease is the antithesis of health, and, as the health of the plant means the correct performance of its functions, disease may be defined to be an incorrect performance of those functions. I believe that of all the various kinds and forms of disease to which plants are liable, none are so general or so fatal as those affecting the roots. In many, perhaps in most cases, it is extremely difficult to say precisely where disease originates and how it is produced. It is only when we see it in some of its intense forms of development that we are aware of its existence.

On the authority of the wisest of men there is nothing new under the sun, yet there are constantly presented to us things that appear, and are to us essentially new. Take the position of a tree. Its position may be said to be unchangeable; the soil, subsoil, atmosphere, and climate may be so far unvarying as to be also unchangeable. On the other hand, the roots of the tree are constantly year by year altering their position, traversing as it were the whole surrounding area in quest of food. Moisture also performs a very important part in the nourishment of the tree, and all strata of soil penetrated by the roots are not equally full of moisture, so that when the roots pass through one stratum the tree is well nourished, and on passing through another it is less liberally supplied. Atmospheric influences also materially affect the tree, and as these vary so the growth varies. Insects, too, do occasional injury to trees by eating or poisoning their foliage, hence, as the foliage is good or healthy, or the reverse, so is the growth of the tree good or bad for that or for succeeding years. The mellow, withered, or fallen leaf in early or midsummer is not always a sure indication of a diseased tree, indeed it is always more satisfactory to find an evergreen tree of any kind shed its leaves freely on agitating the tree, than that they should tenaciously hold by the tree after they have become withered. The decay or the dying of leaves, in some instances, evidently depends on a want of vigour or on partial rot in the roots, but in a great majority of cases it is produced by injudicious planting and after cultivation. As an instance of this, I may state that last September I was requested to inspect the avenue of camphors growing in the Royal Agricultural Show Grounds. For the past two or three years they had looked very sick, each year getting worse, and they would eventually die if something extraordinary were not soon done to them. Various causes have been assigned for the appearance of these trees by those who have expressed their views upon

the subject, but there was no difference of opinion as to their highly unsatisfactory state. Like most other places of similar extent in this part of the Downs, it is evident that the land in the area is not all alike in its suitability for the growth of trees; yet, allowing for the difference, those conversant with tree culture will not have long to seek for the cause of this decay, which has been slowly but surely going on. The decline is not the result of old age, nor of the capability of the soil to grow and maintain the trees in a healthy condition, for a closer inspection of similar trees growing only a few yards away confirmed my first opinion, which was that want of timely thinning and the want of nourishment at the roots, caused by bad planting, were at the bottom of it all. The questions put to me were—"Could anything be done to the trees to give them new life? Was it advisable to plant young trees between them, and when these had made a start to then take the sick ones out?" The answer I gave was—"Leave them to me, with power to act, and they will be given new life." I remarked at the time these were planted that they would never make anything else but shrubs, and that only for a time. I examined the roots and foliage thoroughly, and found that three parts of the branches were dead or decaying, and the foliage scant and yellow-tinted; but on examining the roots I saw at once the cause of all the evil. The trees, in the first instance, had been planted too high; the roots when young had not been spread out; they were simply growing as if they remained in a pot, and those who know the size of these camphors will be surprised at my saying that the roots had not extended more than 6 feet from the stem of the tree, when they should have spread 12 feet at the least. The roots showed up out of the ground 2 feet from the trunk. They had embraced and interlocked each other, and on account of the scant foliage, were exposed to the full rays of the sun, and the remark I made at the time of planting was now justified. My first work was to cut out the dead yellow branches, the centre of which was found to be decayed. Then all the inside branches were taken out, the surface of the soil under each tree was forked over very shallow, and outside the spread of the foliage a trench was dug all around the tree. Now this, of course, is the proper place to apply the nourishment, at the mouth of any tree, as here are situated the extremities of the roots, and as these feeding roots spread out beneath the soil pretty nearly to the same extent as the branches above ground, the tree should be fed at the distance of the extremity of the branches above ground from the stem. Here Nature teaches us a lesson: The head of the tree is in the form of a dome like an umbrella; all around the soil is exposed to the rain, and the water penetrates the earth just where the extremities of the roots are situated to receive it. In addition to this, the greater part of the rain which has washed and refreshed the leaves trickles down from the ends of the branches, and reaches the ground in the appropriate spot. In trenching around the trees, immediately where the branches extended, the men were surprised to find no roots. This was nothing more than my practical experience expected, because, if there had been roots, there would have been no necessity to do anything to the trees; but here was the mischief. The trees were then thoroughly mulched with half-rotten straw and manure, well covering up the large crinkled roots near the stem with a good coating of it. At the extremities, where the feeding roots should have been in the trench, the richest manure was placed, but none was forked in. On the 17th March, the caretaker being present, we found that at the extremity of the trenching, and right up to within 3 feet of the stem, the young fibrous roots had formed a mat, and it was impossible to lift the mulching without damaging these roots. Now, what I wish to draw particular attention to is this: When the men started to fork over the surface they wanted to start near the stem. This I objected to at once, and made them keep their backs to it, showing them where the mistake is often made by digging underneath any tree or shrub. Each time you turn over the soil, so many rootlets suffer, because as you proceed you keep on doubling the roots over towards the stem, and this is carried on until the work is finished, when the soil is generally raked back again. Now, this is against Nature; it is similar to someone doubling your

fingers back upon the wrist and leaving them there. The roots are left in that state until the next season, and then the same cruel operation is carried out again, until the roots are diseased by being constantly bruised and broken, when, of course, the tree suffers and begins to decay. The proper way to clean underneath a tree is to start just at the extremity of the branches, keeping your face to the opening until finished. You need not disturb the soil near the stem of a large tree, for do what you will there you cannot improve the growth of the tree; because all roots at that place cannot feed, being too large, but you can throw some of the soil from the first remove round the stem. If you want to prevent decay, feed them just as I have explained; that is, at the extremity of the feeding roots, and that is just where the rain trickles down from the leaves. A practical man can see immediately what is the matter with any tree that is sickly-looking; if the top of the tree is decaying, it is the fault of the tap-root entering the cold wet ground, and the remedy for this is to excavate and cut the tap-root clean off. I say clean, for the least bruise will affect the tree's future growth. If the branches wither and the leaves fall off from the lower branches, it is because the surface roots have been disturbed and doubled back in the way I have already described. There may be some other cause, but that is the chief one. As all plants in this colony are surface-rooted, it is advisable not to disturb them by that process. If the rootlets require separating the best way is to get a pointed pick and work from the stem by continuous drawing: this does no harm, and the few roots that are torn up are of advantage to the tree's growth; it separates the mats of roots and draws all towards the feeding point. There is no necessity to throw any soil back, get some mulching and cover all underneath the tree with a good coating. If you have any manure especially good, I have told you where to put it.

I know of one instance where the owner, wishing to prevent the roots of a camphor-tree from coming into a bed made around the stem, placed bricks and sheet iron close round the bottom with the object of preventing its roots coming through; but very soon they got beyond this confinement; they turned upwards and now the 2 feet of soil is a mass of fibrous roots, and the tree has splendid foliage.

There is no pursuit wherein so much depends upon the right thing being done at the right time as in this; and in all other pursuits the man of close observation and systematic habits—who is not too proud to learn from any sources, however humble—is the one who will succeed, for there is no better guide than to seek the advice and experience of others, and by following the advice tendered it will be the means of preventing decay, and will also give to the plants new life.

Tropical Industries.

SUGAR-CANE FROM SEED.

(Translated from the *Rapport Annuel de La Station Agronomique pour 1897.*)

By A. ALEXANDER RAMSAY.
Sugar Experiment Station, Mackay.

At the present time there exist already many new varieties which can be cultivated without probable failure, and this number will be added to from year to year, since at various places sowings have been made which have succeeded completely. The sowings are now facilitated because seedling canes yield seed having a germinative power more developed than those from old varieties, and

one has more chance of success if one gathers (seed) in certain localities where the fecundation and maturing of the seed appears to be more normal than in others. The production will be yet more considerable if we could at the time of collecting them make sure that the pannicles that are gathered are fertile, and ample provision be made by neglecting those unfertile, but this verification is difficult and not practical. One is therefore compelled to gather a great number of different productions and try their germinating power by a direct sowing. At the end of eight or ten days one has determined their respective qualities, but by that time it is too late to make a new gathering from the canes which have given a satisfactory result, because the seeds have been scattered by the breezes—strong enough at that time of the year.

When the seeds are fertile one has only to gather the pannicles as soon as the spikelets begin to detach themselves spontaneously, and it is no longer necessary to envelop them beforehand with a gauze to collect the seeds which might be lost. One succeeds quite as well without this precaution, which naturally will be useless if the pannicle does not contain fertile seeds. It is necessary to prepare the ground beforehand, and to sow as soon as possible, because the seeds lose their vitality quickly, and by the end of a month the germination is more tardy and much less abundant. After sowing one ought to cover lightly with fine earth, and water frequently so that the earth may never dry completely; to conserve the moisture it is equally necessary to shade the seed-bed from the sun during the hottest time of the day till all the young plants have acquired a sufficient development; later on they can be pricked into pots of bamboo or "Vacoas" till large enough to plant in the open ground.

It is scarcely possible yet to know which varieties of canes it is best to collect seed from; that is to say, which are the varieties which will give the best results. It is necessary to gather in preference the panicles from the best cane varieties, though one cannot be certain of obtaining a better result because the seed (canes) produced by individuals have no relation to the mother cane either in size or colour, the same (mother) cane yields, by seed, plants of all sorts and of all qualities, but principally of a red, more or less dark, occasionally white, and very rarely striped stalks.

This year sowings made at the "station" have succeeded fairly, but as in last year the seeds collected at Rednit or in the neighbourhood have been almost totally unfertile, whether collected from old varieties or coming from seedling canes. Thus, in an experiment for which each lot was sown in an equal surface of land the following results were obtained:—

- 15 lots gave a negative result,
- 1 lot gave 1 plant,
- 2 lots have each given 2 plants,

though all the flowers have been gathered and the sowings made in the same way. We see thus that the fertility of the seed is very variable, and that at the time of flowering it is necessary to gather plenty of seed and in different conditions to be assured of having some of good quality.

All the young plants planted out do not succeed, a certain number die before making stalk, but those which succeed and develop ought to be propagated by cuttings, and it is only after the first multiplication that one can have an idea of their approximate value.

Of the seedlings planted in this year, the writer says:—"Their growth was generally more active than that of last year, as several plants had already sent up shoots from 2 to 3 feet high two or three months after planting in January. Such precocity has not been noted before. One must remember that this year the season is much more favourable, though last year the drought has probably been the principal cause of delay. This active growth lets in hope that, among the new species, some will accomplish their evolution more quickly than others, and will give more latitude to the period during which we can effect the planting in a given locality."

The results of the manuring experiments carried out on 12 stools of Louzier, at the station, seem somewhat in conflict, but the best results seem to have been obtained from those manured with a mixture of organic nitrogen, from dried blood (ammonical nitrogen), from ammonium sulphate and nitric nitrogen, from sodium nitrate.

Soluble phosphate acid has given better results than insoluble phosphoric acid.

Forestry.

FOREST CONSERVANCY, No. 5.

By A. J. BOYD.

I HAVE in previous papers on the subject of the conservation of the forests of this colony indicated the reasons which render it imperative that the present system, or rather want of system, of dealing with one of our most valuable assets and heirlooms of posterity—the timber trees—should be placed upon an entirely different basis. In those articles I have shown the value of forests, not only as the source of our ever-increasing requirements for various industries and for public and private works but also in their indirect utility, as they affect climate, rainfall, preservation of the integrity of the land during heavy rains and floods, and their powerful agency in preserving and increasing the nutritive power of the soil.

Experts in forestry have shown that evaporation in a forest is only about two-fifths of that in the open country. For instance, from careful observations made in Germany (Bavaria and Prussia) by Dr. Ebenmayer, the following conclusive results were obtained:—

| Stations. | Quantity of Water Evaporated from a Free Surface of Water. Height in inches. | | | Less in Forest, expressed in per cent. of the Total Quantity Evaporated in the Open. |
|----------------|--|------------|-----------------|--|
| | In the Open. | In Forest. | Less in Forest. | |
| Bavaria | 23.53 | 8.61 | — 14.92 | — 63 |
| Prussia | 13.16 | 5.98 | — 7.18 | — 55 |
| Mean | 18.34 | 7.29 | — 11.05 | — 59 |

* Dr. W. Schlich, Manual of Forestry.

Another very important point was elucidated by Dr. Weber, and that is the balance of rainfall over evaporation according to elevation. The following table shows clearly that the balance of water retained by the soil increases rapidly with altitude, and that the evaporation in mountain forests may be reduced to about 10 per cent. of the rainfall:—

| Altitude of Stations in Feet. | Excess of Rainfall over Evaporation in inches. | | Percentage of Rainfall which Evaporated. | |
|-------------------------------|--|------------|--|------------|
| | In the Open. | In Forest. | In the Open. | In Forest. |
| 0—328 | 12.02 | 12.32 | 55 | 37 |
| 328—656 | 12.69 | 13.84 | 53 | 30 |
| 656—1,312 | 12.20 | 17.65 | 58 | 25 |
| 1,312—2,297 | 36.96 | 30.79 | 22 | 13 |
| 2,297—2,540 | 47.10 | 43.08 | 15 | 9 |
| 2,540—3,050 | 56.77 | 46.34 | 19 | 11 |

From these figures it will be obvious that the destruction of forests situated on considerable elevations is fraught with injurious consequences to the underground water supply at the lower levels. The balance of water in the soil, after allowing for evaporation, sinks below the surface and acts as a feeder of water-courses and springs, besides preserving the moisture of the soil by capillary attraction. Doubtless, in addition to evaporation, the forest trees absorb a certain amount of that balance, but not in such excess as to sensibly affect the supply to the springs at lower levels.

EFFECT OF FORESTS ON THE SOIL.

Certain species of trees exercise a beneficial effect upon the soil. This can easily be shown by a consideration of our open forest and scrub lands. In an open forest, say of Stringy Bark (*Eucalyptus eugenioides*, and *E. Baileyana*), an examination of the soil will almost invariably disclose its rocky or gravelly nature, its general aridity, and the sparseness of undergrowth and of grass. Such a forest, where no other or few other trees are to be found, demands certain plant food for its crop, and this the trees constantly take from the soil, so that there is an absolute yearly diminution of some particular element of the latter, and, owing to there being no canopy of broad-leaved crowns to restore the absorbed element, by the decomposition of fallen leaves, &c., these *Eucalypti* are unable to keep up and preserve for their own use the productive capacity of the soil. It is the same with all forests consisting of only one species, which are known as pure forests. Nor can the productiveness of the soil of these pure forests be improved without the expense of planting trees and shrubs suitable for forming an undergrowth. I need not illustrate this further than to point to those portions of the colony where the ridges are clothed with the Silver-leaved Ironbark (*E. melanophloia*), and to the fringes of some of our inland scrubs, covered with a stunted growth of wattle, oak, and other narrow-leaved timber.

If, on the other hand, we examine into the conditions which obtain in the dense coastal and riverine scrubs, a very different picture presents itself.

Here we find a marvellous diversity of species, not only forming a dense jungle, but matted together by gigantic lianas, which, climbing to the tops of the trees which support them, spread out into myriads of leafy tendrils, thus assisting to form a dense canopy of shade overhead. It requires no great intelligence to realise what must be the inevitable effect of such a canopy on the soil beneath. Evaporation has scarcely any appreciable effect on the rich humus formed by the decomposition of masses of fallen leaves, rotting trunks, and branches of soft-wooded trees. A warm atmosphere highly conducive to the forcing of growth, and a constant moisture in and below the surface, are amongst the beneficial functions of the shade overhead. The soil is constantly kept up to a high standard of productive capacity, as is evidenced by the gigantic growth of many of the scrub trees. Amongst the most important of these, for the purposes above mentioned, are the Gigantic Stinging-tree (*Laportea gigas*) with its congener, the Shiny-leaved Stinging-tree (*L. photoniophylla*). The former often attains a height of from 60 to 100 feet, with a diameter of from 4 feet to 7 feet, whilst its leaves are a foot in diameter. The latter also attains a great altitude and diameter, but its leaves are much smaller, being only about 6 inches long and about 4 inches in width.

In both these species the wood and bark are soft, the former of a spongy, fibrous nature. When they are felled, or have reached the ground by natural means, they decay in an incredibly short space of time, and so add to the richness of the soil.

The Bottle trees of the scrubs (*Sterculiæ*) occur in most of the southern scrubs, but usually some distance from the coast. They often attain a diameter of 7 feet and even more, and a height towering far above the scrub timber. The bark is hard and brittle, and forms, as it were, a casing surrounding a succulent, watery, mass of fibrous matter. When these trees fall, their decomposition is even more speedily accomplished than that of the Stinging-trees, and it has a very marked effect upon the soil on which the trees have fallen.

Besides these, there are other soft-wooded varieties, which exercise the same beneficent influence, and in the northern scrubs of Queensland, and in many of the southern ones, palm trees of various kinds and clumps of wild bananas are plentiful. All these, by their decay, help to keep up the marvellous fertility of the scrub soils. The scrubs are the natural home of the Red, White, and Pencil Cedar (*Cedula Toona*, *Melia composita*, and *Dysoxylon Muellerii*). The Silky Oak (*Grevillea robusta*), the Kauri Pine (*Agathus robusta*), the Hoop or Moreton Bay Pine (*Araucaria Cunninghamii*), the Crow's Ash (*Flindersia Australis*), the She-Pine (*Podocarpus elata*), the Tulip-wood (*Harpullia pendula*), the Deep Yellow-wood (*Rhus rhodanthemum*), the Beech (*Gmelina Leichardtii*), the Hickory (*Acacia autocarpa*), Bean-tree (*Albizzia Thozetiana*), and a multitude of other timber trees, far too numerous to enumerate here, but all of economic value either for building purposes or for ornamental work, are at present found in profusion in the scrubs all over the colony. The Bunya Pine (*Araucaria Biduillii*) cannot be classed amongst the chance scrub trees. It is of a gregarious habit, and constitutes really a "pure" forest.

It is not, however, the purpose of this paper to describe the timber trees of Queensland, but rather to point to some means which might be adopted having for their object the preservation of the forest timbers which still remain to us despite wholesale destruction in times past, and despite the denudation which is still going on notwithstanding that certain restrictions have of late years been placed upon the indiscriminate cutting of timber of all sizes by the framing of the Timber Regulations, by which licenses are issued to timber-getters in the State reserves. These Regulations, however, do not appear to meet the urgency of the case. The few Crown land rangers, whose duty it is to see that only those persons having licenses cut down any timber for sale (and that only of certain sizes) cannot be everywhere at once, and the Regulations are constantly being evaded. The following ideas have long ago suggested themselves to my mind as being suitable to the conditions under which the timber industry is carried on in Queensland:—

SUGGESTIONS FOR THE PRESERVATION AND PERPETUATION OF THE STATE FORESTS OF QUEENSLAND.

Assuming that the largest proportion of the wooded areas of Queensland is under the control of the State, and that these areas are required for the twofold purpose of supplying the requirements of the colony for the purposes of the building trade of the railways and other public and private works, and of contributing to produce climatic and mechanical effects, then it would appear to follow that the State would have ample justification for taking the forests under its protection, and adopting measures for the maintenance of the valuable timbers now slowly but surely disappearing before the axes of the lumberer and of the farmer. Several schemes have been put forward by practical men for the conservancy of our forest and scrub timbers, but all of them, so far as I have been able to gather, are based on the necessity either for planting denuded areas or for employing labour to clear young naturally growing trees of surrounding encumbrances in the way of clearing off heads of trees left by the timber-getter, young vines, and undergrowth. Such schemes, however, involve a large expenditure, and the least amount set down as requisite for the work is £10,000 per annum.

Such expenditure is, in my opinion, not needed, at any event, for some years. What is required to keep our timber supplies constant is not a system of wholesale planting, but of helping nature a little. Indeed, the best method of dealing with the forests would be to close them against indiscriminate cutting under the licensing system, and to adopt the plan of closing them against all operations, licensed or unlicensed, until the marketable timber on certain blocks in every forest district has been marked by the officer in charge of forests. There are two methods which might be adopted in disposing of the timber. One of these is by selling it at auction to the highest bidder, the other by imposing a royalty at per 100 or 1,000 feet on all timber marked and cut by the licensee.

For this purpose timber leases might be granted for a single year, or for a term of years, and no timber lease should exceed in area 10,000 acres. Such timber leases should include the right to cut, remove, and sell any kind of timber, or any scaffold poles, piles, &c., &c., growing on the leased area, subject to certain conditions to be laid down by the Minister. The rental for any such timber lease should be paid in advance.

Where agricultural settlement has taken place, it should lie within the Minister's discretion to grant permits to *bonâ fide* farmers to cut such timber as they may require for fencing and building purposes, free of cost. The lessee of any timber lease should be required to protect all young seedlings and saplings of useful timber trees, but not to the extent of insisting on his employing labour for this purpose.

There will arise cases in which it will be necessary for the lessee of a timber selection to build tramways to connect his field of operations either with a sawmill or a railway, and further, such initiatory field of work may be subsequently abandoned. In such case the Minister may grant to the lessee of the abandoned lease permission to retain the use of his tramway provided it be connected with another leased area.

It is obvious that under present conditions a leased area of 10,000 acres will not all be productive during the currency of the lease. Under such circumstances a lessee may be empowered to surrender such portion of the lease as may have been denuded, or he may retain the said portion at a reduced rental, until during the term of the lease (which may extend to 25 years) it has again become productive, but at a reduced rental.

All timber felled and not removed within a certain period after the termination of the lease shall become unconditionally the property of the Crown, unless the Minister shall see reason to extend the period for removal.

Any person removing timber or bark from a timber area without a license shall be liable to a fine of £100.

Under the present Regulations the standard sizes at which various trees may be cut are—

| Minimum Circumference at 6 ft. from the Ground. | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|---------|
| | | | | | | | Ft. in. |
| Red Cedar | ... | ... | ... | ... | ... | ... | 7 6 |
| Kauri Pine | ... | ... | ... | ... | ... | ... | 6 0 |
| Hoop Pine | ... | ... | ... | ... | ... | ... | 5 3 |

The size at which Hoop Pine may be cut is manifestly unfair, as there are quantities of this timber in the West Moreton district rarely exceeding 18 inches in diameter, or about 5 feet in circumference. The timber is well grown and eminently suited for the mill, and if much of it were cut there would thus be room for the young seedlings and saplings to shoot up and provide future supplies.

The Bunya Pine is absolutely protected. A glance at my "Forest Conservancy," Part II., page 3, will show the rate at which the trees abovenamed increase in diameter after topping the scrub.

With reference to the stripping of bark, cutting piles, scaffold poles, and dead timber, standing or fallen, such matters could, I think, well be left to the discretion of the conservator or inspector of forests, subject to the Minister's approval of his recommendations.

One thing in connection with the cutting of piles should be seriously considered. Piles and stumps for house building are always selected from the very best timber suitable for such purposes. Swamp mahogany for the former and ironbark, gum, and peppermint for the latter, are trees of slow growth. If not cut for these purposes, they would in time form trees of great value, and I therefore think that the same price per 100 feet or the same royalty should be charged for these as for the mature trees. I would even apply the principle to the sale of scaffold poles. This is, I think, the system adopted in Western Australia, and for much the same reason as I have advanced—viz., the deterioration to a forest being as great by the cutting of a sapling as by the cutting of a pile.

DEMAND FOR QUEENSLAND HARDWOOD.

It cannot but be a source of gratification to Australians to know that Australian hardwoods are in demand all over the world, particularly in England. Once a "run" on our timber has set in, the process of denudation will proceed at a vastly increased rate. How absolutely necessary must it then appear that the forests be at once taken under the protection of the State; that stringent regulations as to cutting and conservancy be adopted; that inspection be rigid, and penalties for infringement of the regulations be enforced without respect of persons. It is easier to control the first flow of the tide than to stem it when in full flood. To do what I have here indicated would not entail any great expense. A conservator of forests and a few extra rangers are all that would be required, and their salaries and contingent expenses would be far more than recouped by the extra gain to the State in forest revenue. I do not say that such gain would be a direct profit to the Treasury. Probably the expenses would be heavier than the revenue, but that should not weigh for a moment in the scale when set against the preservation of our forest timbers for all time.

PRELIMINARY STEPS.

The State forests of Queensland are supposed to have an aggregate area of 162,877 acres, and other lands, classed as timber reserves, but which include areas reserved for other purposes besides forestry, include an area of 1,508,374 acres. I say that the forests are *supposed* to cover 162,877 acres, because it is highly improbable that any official in the colony can to-day state with certainty how much of the reserves is actually available for the production of marketable timber or how much has been completely denuded of such.

In Queensland there are State forests in the following districts:—

| Place. | Area—Acres. | District. |
|-----------------------|-------------|--------------|
| Fraser Island | 108,800 | Maryborough. |
| Barron River | 1,450 | Herberton. |
| St. Mary | 1,357 | Maryborough. |
| Bungorah | 2,300 | St. George. |
| Glastonbury | 4,480 | Gympie. |
| Woondum | 640 | " |
| Noosa | 640 | " |
| Kilkivan... .. | 5,600 | " |
| Como | 5,766 | " |
| Marodian and Kilkivan | 19,200 | " |
| Warrah... .. | 7,100 | Maryborough. |
| Brooyar | 5,544 | Gympie. |
| Total | 162,877 | |

One of the first things to be done in the event of the formation of a Department of Forestry would be to have the above areas accurately surveyed and their timber resources examined and reported upon by competent men. Much of the land coming under the head of State forests has comparatively little timber of any value on it, and such lands might be thrown open to agricultural selection wherever the soil is suitable for such settlement; but where large quantities of forest or scrub timbers are found, on no account should such lands be thrown open to indiscriminate selection, as the inevitable consequence must be the extermination of what ought to be, and would prove to be, a most valuable asset of the State.

It might be advisable to proclaim additional areas as State forests where it is found that owing to contiguity to a port or to navigable streams, to configuration of the country, to climate, soil, and to the classes and quantity of timber trees, such areas could be profitably worked.

INSPECTION OF TIMBERS FOR EXPORT.

In concluding this paper, I must not omit to draw attention to the probability of a larger export trade in our Queensland timbers in the near future. When that trade arises, and large orders are received from the United Kingdom or from the continent of Europe for log timber suitable for railway sleepers, wood-paving, furniture-making, &c., it will become of paramount importance to retain the business. To this end all timber for export should be examined and passed by a Government inspector, who would, after approval, affix the Government brand to such timber. If this is not done, there is nothing easier than to bring our timbers into disrepute in the home market by mixing them. If we profess to supply that market with a certain class of timber, it should be the duty of the Government to see that none but the very best of that class is shipped, without intermixture of any kind. The inspectors would naturally be stationed at the port of export, and also at certain portions of the State forests where timber is being cut to order. They need not be resident at any particular point; but their services should be always available when they are required.

Of course the foregoing remarks are merely crude suggestions, which would require much thought and study to reduce to workable shape; but I venture to think that they may form a groundwork on which to build up a thorough system of forest conservancy in our colony.

The belief that it is high time that something were done in the way of preserving our forests from annihilation, appears to be steadily gaining ground. And not only is this so in Queensland, but in the neighbouring colonies and in the United States of America. Indeed most civilised nations have either taken energetic steps to renovate their forests, or are on the eve of doing so. In Western Australia excellent work is being done in forestry. From the last report of Mr. J. Ednie-Brown, Conservator of Forests in that colony, we gather that its progress in the timber industry during the last three years has been immense, and almost phenomenal. The value of the marketable timber now growing in Western Australian forests Mr. Brown places at £124,000,000, and he considers even this large amount as an under estimate, and he emphasises the statement that it is most necessary that the forests should be properly looked after by systematic conservancy to ensure their permanency. If dealt with now in an enlightened manner, the forests of that colony have a bright future before them, and will become a lasting, revenue-producing asset of the State.

"Nothing," he says, "worth speaking of has yet been done to avoid making their future management anything other than a success. This fact must be gratifying to all concerned, and is certainly encouraging to those who have the privilege and honour of instituting such a complete modern system of forestry in the colony as will entitle these forests to be recognised as one of the most important and reliable resources of the country."

The total output of sawn stuff of all sorts from the sawmills of West Australia last year was over 322,000 loads, representing a gross value of about £2,000,000. Since it may be said that the timber industry has only become of much importance during the last three years, it is natural to expect that it will enormously expand in the future, and that, under a proper system, the Government, which at present obtains an annual revenue of only a little over £23,000, will receive more than double that amount from timber leases, licenses, and royalties on timber. The total expenditure of the Department for the year ending 30th June, 1898, amounted to only £3,954 16s. 1d.

We have persistently printed articles on forest conservancy in this *Journal*, and the letters we have received on the subject conclusively prove that a widely-spread interest in the question exists. For instance, one farmer (Mr. William Main, of Sunny Bank) writes to the following effect:—

"Everyone who has given thought to the matter must sympathise with your frequent remarks on the destruction of valuable timber, an article on which, from another pen, also appears in your June number. It seems to me, however, that this is a question with which the ordinary bush farmer has nothing to do.

To the Government must be entrusted the duty of providing timber for future generations, for only the Government can afford to take the necessary steps for planting and preserving on Crown lands indigenous trees to replace those that have gone into present day use. A selector has a living to make, and there is no money in growing gum-trees. Even if timber-getters had not long ago removed every sound log, leaving of course the stump, the best timber acres on the coast, scrub or forest, would not return one-tenth part of the cost of clearing.

In the case of ordinary bush land, timber returns absolutely nothing. The best untouched timber land is worth 20s. per acre to fell, but, if the timber-getter had to stump every tree he took, he simply could not take them for nothing, but would require to be paid for his labour. The other day two men applied to a Divisional Board for permission to cut down two ironbark-trees standing on a road, intending to use them for fencing. The Board gave the required permission on condition that the stumps were removed. I scarcely need say the trees are still standing.

Our most fertile lands are on the banks of rivers and creeks, and, granted that the scrubs lessen the evils of floods, are the advantages gained by clearing and cultivating such lands not more than sufficient to counterbalance the evils? Nor is a flood always an evil; and when a big flood does come, a little clearing more or less does not matter.

Divisional Boards, with their roads and culverts, have done far more to increase floods; but surely no one would suggest that roads should not be formed.

As far as rain is concerned, perhaps more can be said in support of the theory that rain produces trees than that trees produce rain. Proximity to the sea and the natural formation of the land have more to do with rainfalls than the timber. Take, for example, Otago, New Zealand, the best cleared and cultivated land I have seen in the colonies, and nowhere will you find more regular rains. Nor do the deer forests of Scotland, where scarcely a tree remains, lack rain. But go 30 miles west of our Main Range, and you are in comparatively a dry land, almost free from timber, for the moisture is not sufficient to produce and maintain forests. The Main Range gives the moisture to the coast.

The man who clears a mountain side, and expects the soil to remain, deserves all he gets from Nature; but if we wish to be as certain as possible of seasons and crops in Queensland, we must clear away the bush, though it cost £8 per acre in addition to the price of the land, and in return we shall get the coastal rains. Otherwise we are throwing away money that would purchase three times as much land on the Downs all ready for the plough. Let our farmers extend their clearings, and let the Government provide for forest conservancy, and all will be well.

SOME TIMBER TREES OF QUEENSLAND.

By J. W. FAWCETT,
Member of the English Aborigines Society.

THE BROAD-LEAVED POPLAR GUM (*Eucalyptus platyphylla*, F. v. M.)

BOTANICAL DESCRIPTION.—The Broad-leaved Poplar Gum is a tree of variable size. In many places it is only of moderate size, attaining a height of from 40 to 60 feet, with a diameter of from 12 to 18 inches. In other districts it sometimes reaches a large size, growing to a height of as much as 120 feet or more, with a diameter in proportion. It has a handsome appearance, with spreading branches and shady, light-green foliage.

Bark.—The bark is smooth and deciduous, and varies in colour from a creamy white in extra tropical climates, to a yellow brown within the tropics.

Leaves.—The leaves are often very large and broad, somewhat cordate or heart-shaped, or resembling very large poplar leaves, and measure as much as from 3 to 6, and even from 8 to 12 inches wide, by from as much as 12 and even 18 inches long. They are deciduous.

Flowers.—The flowers are from 3 to 6 in number, on short angular pedicels or flower-stalks, in short peduncles.

Fruit.—The fruit is an oboconical capsule, from a-quarter to half-an-inch in diameter.

VERNACULAR AND BOTANICAL NAMES.—The Broad-leaved Poplar Gum, or Broad-leaved Gum, so called from the shape of its leaves, is also known as the Cabbage Gum or Cabbage-leaved Gum—from the large leaves having a resemblance of those of cabbages—and the Nankeen Gum, so called from the peculiar yellow-brown colour of its bark. The last name is that by which it is best known in the Northern Territory of South Australia. The specific name, *platyphyllo*, was given to this species by Baron Mueller in allusion to its very broad leaves.

DISTRIBUTION.—The Broad-leaved Poplar Gum is found growing in the coastal districts of tropical Queensland, North Australia, on the islands of the Gulf of Carpentaria, and in New Guinea. It is a tree of variable appearance. On the plains of the Northern Territory of South Australia, where it is a very common *Eucalypt*, it is known under the name of the Nankeen Gum, from the colour of its bark. In the swampy districts of southern tropical Queensland, where it is fairly common, the bark is of a creamy-white colour, while the general character of the tree is somewhat different.

A singular characteristic of this tree is that, when young, the leaves are of an enormous size, 1 foot or more in length and breadth. This gives a peculiar aspect to the shrubby undergrowth, especially of the Northern Territory, where the young gums look more like cabbages than *Eucalypts*.

USE.—The Broad-leaved Poplar Gum yields a deep red or dark-coloured timber, more or less subject to gum-veins. It is hard and closely grained, somewhat curly, but very durable. It is useful for fencing materials, and is excellent for using in damp places.

Owing to its large leaves it is a splendid shade tree, and, as it will grow alike in exposed and sheltered localities, is a tree that should be much planted for ornament and shade.

THE MORETON BAY ASH (*Eucalyptus tessellaris*, F. v. M.)

BOTANICAL DESCRIPTION.—The Moreton Bay Ash is a graceful tree, of a varied size. At times it is very small, whilst at others it attains large dimensions. Its average height is from 30 to 60 feet or more, with a diameter of from 14 to 24, and even 30 inches.

Bark.—The bark is of a very dark-brown colour; that growing on the lower part of the trunk is persistent, or remaining fast, and cracked or split into square or angular fragments, whilst that of the upper part of the trunk and the branches is deciduous, or falling off in thin sheets during the spring, leaving a smooth white inner bark.

Leaves.—The leaves are linear, straight, or curved, from 3 to 6 inches in length.

Flowers.—The flowers are not numerous; they are arranged in short peduncles, often several of them together in lateral clusters or in short panicles. They are in blossom from December to February.

Fruit.—The fruit is an ovoid capsule, about $\frac{1}{4}$ inch in length, and very fragile, more so than that of most species of *Eucalyptus*.

VERNACULAR AND BOTANICAL NAMES.—The Moreton Bay Ash is so called, first, from a supposed outward appearance to the British ash, and then from its being first found in the Moreton Bay district of Queensland. The specific name *tessellaris* was given to it by Baron Mueller on account of the bark at the base of the tree-trunk being split into squares.

DISTRIBUTION.—The Moreton Bay Ash is found throughout the whole of the coastal districts of Queensland, being generally found on the lower ridges, on alluvial flats, and banks of streams, and also in north-east New South Wales, North Australia, and New Guinea.

USE.—The Moreton Bay Ash yields a useful, close-grained, tough, but not very hard, timber, the heart wood being of a dark-brownish colour, and the sapwood a light-coloured or whitish colour. It is somewhat elastic, easily worked, of great strength and durability, especially that of trees in North Queensland. It is much used for flooring-boards, staves, and various kinds of artisan's work, and also for piles for houses, and bed-logs in the construction of quartz and sugar mills. From the trunk a yellowish-white gum-resin exudes, which is very astringent. This gum crystallised is very efficacious in cases of diarrhoea and dysentery.

There is a variety of this tree (*E. tessellaris*, var. *Dallachyana*), named after John Dallachy, an ardent botanical collector, found in the neighbourhood of Rockhampton. It is generally a small tree, with crooked stems, and without the tessellated bark at the base.

THE TALLOW-WOOD (*Eucalyptus microcorys*, F. v. M.)

BOTANICAL DESCRIPTION.—The Tallow-wood is a handsome large tall tree growing to a height of from 80 to 140 and 150 feet, or even more, with a diameter of from 3 to 5 or 6 feet, perhaps more.

Bark.—The bark is often furrowed or broken by shallow cracks, persistent on the trunk and larger branches, sometimes even to the smallest ones, fibrous, and of a reddish or rusty colour.

Leaves.—The leaves are alternate or opposite, ovate-lanceolate in shape and dark-green in colour, about 4 inches in length, and with very fine veins.

Flowers.—The flowers are from 4 to 8 in number, on short terminal corymbs, with a yellowish tinge, and are in flower from August to November.

Fruit.—The fruit is an obovoid oblong capsule, about $\frac{1}{4}$ inch in length, and are ripe from February to May.

VERNACULAR AND BOTANICAL NAMES.—The Tallow-wood derives its name from the greasy nature of its timber when first cut. It is also called Forest Mahogany, from the resemblance of its timber to the real mahogany; Peppermint and Turpentine tree, from the leaves being rich in volatile oils having the smell of these articles; and also Red Stringybark, from the reddish colour of its fibrous or stringy bark. The specific name *microcorys* is derived from the Greek, and signifies a "little helmet"; and was given to this tree by Baron Mueller in allusion to the small operculum, cap, or hood, of the flower.

DISTRIBUTION.—The Tallow-wood is found on hills, spurs of ranges, and higher lands of the coastal districts of South Queensland. It prefers well-drained localities, and especially those that are sheltered. It is also found in New South Wales.

USE.—The Tallow-wood is a valuable timber tree, yielding a handsome, strong, durable, very tough, close-grained, yellowish, or yellowish-brown timber, sometimes more of a greyish than a yellowish colour. Like most of Australian hardwoods it darkens with age. It is of a greasy nature, and especially so when freshly cut, at which time it is quite slippery and hard to hold. The timber is free from gum or kino-veins, and is easily worked by both the plane and saw. Owing to the presence of the greasy, oily, or waxy substance it is difficult to split, and this also hinders it from twisting, though it does not retard its shrinking. It takes a long time to season, but when it is dry it is more valuable than many other hardwoods, and is equal in durability to either ironbark or spotted-gum. It is used for railway-sleepers, bridge decking, culverts, posts, and rails. Being both strong and hard, it is durable both above and underground, and also lasts for a good while under water. It is also useful for all building purposes requiring strength and durability, especially piles, posts, slabs,

flooring-boards, and veranda mouldings, and turnery, as well as for shipbuilding purposes, and especially for breast-hooks and knees. It is used by wheelwrights for cogs, felloes, naves, and spokes, and is also a useful timber for palings and staves. It is an excellent timber for paving blocks, and with blackbutt occupies the premier place in that line. It does not burn well owing to a liquid substance found in its timber which exudes and puts the fire out. The young, tall, straight trees make excellent telegraph poles.

Charcoal made of this timber is very good for blacksmithing purposes.

Chips of the Tallow-wood steeped in water for a day or more give a blackish dye.

The leaves are remarkably rich in volatile oil, 1 ton of fresh leaves yielding 375 oz. of the liquid.

The gum or "kino" which exudes from the tree contains from 50 to 55 odd per cent. of kino-tannin. It is dark coloured, and, as it contains an admixture of sour or nauseous principles (free malic or tartaric acid), it is unfitted for medicinal purposes.

The Tallow-wood is one of the best *Eucalypts* to grow for ornamental purposes. It is a rapid grower, and does not take long before it becomes an umbrageous shade tree, of shapely appearance, and neat, dark green foliage. It commences to produce blossoms at from about five years of age.

FORESTRY IN JAPAN.

REPRESENTATIONS are being made urging the Japanese Government to adopt the policy of gradually selling the State forests and moors to the people. It is pointed out some 19,000,000 acres of State forests throughout the Empire produce a gross revenue of only about 1,000,000 yen, the cost of collecting which is over 600,000 yen, so that the actual revenue received is hardly 400,000 yen. On the other hand the 18,250,000 acres owned by private individuals pay taxes to the amount of 610,000 yen; so that the people can afford to pay a tax of 50 per cent. greater than the whole profit obtained from a larger tract of finer forests under official management. Though more attention is being paid to the preservation of forests, in many places owing to clearings for agricultural purposes, enormous trees are cut down, and the difficulty of transport being great as well as very costly, are either burnt where they fall, or preferably left lying while cultivation is carried on round them.—*Engineer*.

WATTLE-GROWING.

WHILST wattle cultivation has never been entered upon as an industry in Queensland, yet a considerable quantity of the bark is stripped every year from trees growing naturally in the bush. All over the country, and nearly always on the poorest soil, the wattle of several varieties grows to perfection, and there are many thousands of acres, which will never be utilised for agriculture, but which would return a considerable profit if planted with wattles.

In this connection it will be interesting to read some remarks on wattle-growing, by Mr. G. C. Newman, at a meeting of the Lucindale Branch of the Agricultural Bureau of South Australia, in August last. Mr. Newman said he had great confidence that this could be made one of the most profitable industries of this district, as the soil, climate, and the facilities for delivering the bark at a seaport are all that can be desired. He saw part of a plantation east of Adelaide stripped, the yield being 4 tons per acre, and enough small wattles being left to make another good yield in two or three years' time. The price obtained for the bark was £5 5s. per ton in the field; the price paid for stripping was £1 5s. per ton, which included cutting the trees down and packing them in heaps; the landowner receiving £4 per ton clear, equal to £16 per acre. The land was of poor quality, being very stony and sandy. During the

past 10 years he had experimented in wattle-growing in this district, and proved that they can be grown on almost any land that is over 3 feet above the level of the winter flood waters. A few months ago he stripped a wattle seven years old that gave over 1 cwt. of bark fit for market. Trees of that size standing 20 feet apart each way would give over 5 tons per acre. That tree was grown on a limestone ridge (red soil), and he had them of nearly equal growth on the fern hills (white sand). As there are thousands of acres of open fern land in this district almost useless for grazing, and eminently suited for wattle-growing, he would strongly urge leaseholders to give that industry a trial. Such land is leased at from $\frac{1}{4}$ d. to 2d. an acre annually. About four years ago he planted 1 acre of fern land, and now estimates the wattles on it to be worth £8 to £10. Although the wattle has never been systematically cultivated at Mount Benson, in the Kingston district, still it grows there over a considerable area, and last season no less than 1,200 tons of bark was stripped and sent to market, the price received ranging from £3 15s. to £4 per ton; and as stripping costs £1 per ton, it means £1,200 being distributed amongst the labouring classes of the district, and about £3,500 amongst the landholders and teamsters. The bark grown at Mount Benson is deficient in tannic acid, consequently a lower price has to be taken. Where only a small area is to be planted he found the following a good plan:—Commence at one side of the field, using a double furrow plough, strike out the length of the piece to be planted, then mark out back again parallel with the first furrows and about 8 feet away from them, and so on through the field. Then take 1 lb. of good seed for each acre, place in a vessel, and cover with boiling water, and allow them to soak for 24 hours, then drop them regularly along the ploughed strips and cover with a harrow. The next year it will be necessary to thin out the plants in the rows to the required distance. Where large areas are to be cultivated it would save time and labour to have a box fitted to the back of the plough with a roller through it, and worked by a belt with the rear wheel, and so made to drop a seed or two at each revolution, and a small harrow attached would complete the planting in one operation. One team should do 8 acres a day. About every 5 chains it is advisable to leave a strip 16 feet wide unplanted for the purpose of drawing furrows in summer to check a possible fire, and later on as a roadway for carting out the bark. He could not recommend broadcast sowing, as there is so much more labour in ploughing all the land, and the work of thinning out the young plants is very much greater. He would strongly advise that only seed of the true broad-leaf wattle should be planted, as it is doubtful whether it will pay to grow any other variety, the bark of which will be worth quite 20 per cent. less. Horses may be allowed the free run of a wattle paddock, but cattle should be kept out altogether, and sheep should not be allowed in until the tops of the plants are out of reach, as they are very fond of the young shoots. He felt certain that if the bark had no market value it would pay well to plough fern hills, and sow 3 or 4 lb. of seed per acre broadcast, and keep all stock out for three years, by which time the wattles would provide a very large amount of feed for either cattle or sheep.

THE FORESTS OF SIBERIA.

A GREAT portion of the undeveloped wealth of Siberia lies in its forests. But, with the continuous opening up of the country, it has been found that these forests are far from being of such importance in this respect as was generally supposed. In those regions of Siberia which have been more particularly developed, as, for example, the southern portion of the province of Tobolsk, in the central region of Tomsk, and in the Altai district, the lack of forests is keenly felt. This is seen from the fact that the above districts were not able even to furnish the necessary wood for the construction of the Trans-Siberian Railway. The immense forests which stretch away to the north bear evident traces of having been worked for centuries in an abnormal manner, and in addition forest fires have played great havoc with them.

The construction of the Trans-Siberian Railway has naturally given a great impetus to the development of industrial activity in that region. The Imperial Ministry of Agriculture and Domains, fully aware of the immense importance of preserving and duly working the Siberian forests, out of regard for the future supply of the newly formed manufactories, has taken a series of measures in that direction. As the necessary material was not available for elaborating a general scheme for the cultivation of these forests, the Ministry charged several leading and competent officials with the task of studying on the spot the forests of the province of Tobolsk, Tomsk, Yenisseisk, and Irkutsk, as well as of the districts of Akmolinsk and Temipalatinsk. These officials have just issued their report under the title of "The Condition and Needs of the Forest Domains in Siberia." The Siberian forests still occupy an immense surface, but their value is lessened by the fact that they are scattered very irregularly about the country. In those districts in which the population is densest, the forests are lacking; on the other hand, in the sparsely peopled regions, there are immense forests, which are not only turned to little use, but are also frequently destroyed by fires. Again, the cultivation of the forests has hitherto been absolutely barbarian; in the populated districts the coniferous trees have been almost entirely destroyed, and only trees of very little value are to be met with. Nevertheless, if attention could be paid to the proper cultivation of the forests, they will become, in course of time, a source of great wealth for the country, and will furnish supplies of wood for exportation by way of the Obi and Yenissei.

When once the arbitrary clearing away of the Siberian forests has been rendered impossible, the timber trade, which is at present in the hands of small merchants, will be developed on more rational lines, and will then become an important factor in the economic activity of the country.

Hitherto, the leading Siberian merchants have disdained to devote themselves to this branch of commerce, since they found it to be insufficiently lucrative. Thus there still remains much to be done in order to give an impetus to the Siberian timber trade, and in this respect attention must first be paid to opening new routes of transport, and the great waterways of this immense region, now in many districts inaccessible to navigation, must be put in proper working order. Those reforms can be brought about only at considerable sacrifice, both of money and of time. Meanwhile the forests administration has decided to take upon itself the cultivation of the forests domains exclusively for the needs of the local population. During the present year these authorities have received orders to supply wood to the Siberian Railway, and also to the Ural Railway. This is only a beginning, and the forests administration will be called upon to supply timber for shipbuilding and for consumption by the local population.

At this moment the chief depôt for timber is the town of Omsk, which, being surrounded by barren steppes, plays an important part for the neighbourhood from this point of view. The inquiries made by the officials appointed by the Ministry of Agriculture and Domains have shown that the work of colonising the Siberian forest domains is capable of being greatly modified.—*Engineer.*

TREES AS HISTORIANS.

THAT trees record their own history may to some seem strange, yet it is true, whether or not we are able to read it. A Vermont correspondent in *Meehan's Monthly* for July says: Most anyone can tell the age of a tree by its rings, and here let me say there are three ways to tell—two by the inside and one by the outside.

The methods of counting the years of a tree from the inside are, first by cutting a tree down, and sawing off a section or block and counting the rings or circles, which anyone can do. Another way is to split the block open and count the sections on a medullary ray; it will be found that each section

corresponds to each ring, or one year's growth. The third way is to count the spaces between the rows of limbs on a standing tree. This is easily done on the spruce, pine, &c. It will be observed that some spaces are longer than others, corresponding to a thicker growth of the corresponding ring and a longer section of the medullary ray. I have a large number of bits of wood, both of maple and beech, illustrating these statements.

So much for the tree's record of its own age. Trees also indicate their locality where grown, whether on a mountain or in a valley; also the colour and nature of the soil, amount of sunshine, temperature, moisture, &c.

Again, trees reveal the points of compass, especially the hemlock, by its extreme top leaning to the east. It has often been noticed that the heart of some trees is far from the centre, near one side. In such a case, the tree is well fed on one side and lacking food on the other. A ledge on one side, and fruitful soil on the other, makes the difference, and accounts for the position of the heart.

A tree also indicates barometric conditions by absorption of moisture through the roots, on certain days, and from the atmosphere through the body of the tree. It also indicates the days on which they will not absorb.

So a tree, especially the maple, indicates the difference between a heavy and a light atmosphere or when the mercury is high or low in the barometer. By a certain experiment I have made with the maple, in the summer, when the tree is in leaf, I noticed these barometric conditions.

When the tree is not in leaf, by a few experiments, especially during sap-flow, I can not only tell when the tree is in pressure and suction, but I can tell the amount, in pounds, to the square inch.

So we see a tree has a wonderful record of facts, whether we are able to read them or not.

TEMPERATURE OF TREE TRUNKS.

SOME instructive observations on the temperature inside tree trunks were recently communicated by Mr. R. A. Emerson to the Academy of Sciences, Nebraska. When the trunks and limbs of trees are shaded, their temperatures, if above that at which water freezes, vary according to the temperature of the outside air. Moreover, in the shade, tree temperatures above the freezing point of water are higher than the air temperatures when both are falling, and lower when both are rising. When exposed to bright sunlight, however, the tree temperatures, in circumstances otherwise similar, are higher than the air temperature, not only when both temperatures are falling, but are often higher also when both are rising. One side of even a small limb may consequently have a temperature much higher than the air, and the opposite side a temperature lower than the air.

Animal Pathology.

MALIGNANT OEDEMA IN CATTLE.

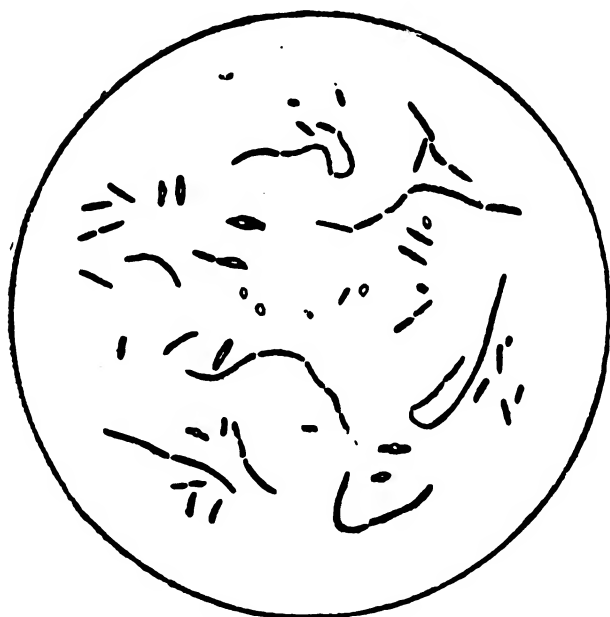
THE following interesting and important report, by Mr. J. C. Pound, Director of the Stock Institute, to the Chief Inspector of Stock (Mr. P. R. Gordon), has been handed to us for publication:—

RE MR. HAMMOND'S CATTLE DYING OF MALIGNANT OEDEMA.

I have the honour to report that on the 23rd instant I received a letter from Mr. T. Hammond, of Grandchester, stating that several of his cattle had died under peculiar circumstances, and that many others were still exhibiting symptoms of sickness. I therefore requested my assistant (Mr. Harris) to visit

Mr. Hammond's place, and to gather all the available information, examine the carcasses, and bring back specimens of the internal organs, contents of stomach, &c.

According to information supplied by the owner, 25 animals (including cows and calves) were turned into a paddock close to Calvert Railway Station, near Grandchester. On the following day 3 animals were noticed to sicken, and within 24 hours each animal was dead. On the 22nd September several fresh animals were introduced into the same paddock, and when my assistant arrived on Saturday, the 23rd instant, a young heifer had just died. He prepared a number of microscopical preparations of blood and serum from various internal organs—*i.e.*, the heart, lungs, liver, kidney, and spleen. In most of these specimens, which I stained in gentian violet and methylene blue and examined microscopically, I detected numerous thread-like bacilli which in fresh specimens were extremely motile. From the morphological and cultural characters of these bacilli, their behaviour to staining reagents and the symptoms and *post-mortem* appearances of the diseased animal, there can be very little doubt that this animal, and probably the others, died from *malignant œdema*.



Bacillus of Malignant (Edema, showing development of spores $\times 1,000$.

As the bacillus of malignant œdema is distinctly an inhabitant of the soil, I am of opinion that it is brought to the surface by growing vegetation during the spring time after rain, and finds its way into the subcutaneous tissues through lacerated wounds on the skin, caused most probably by the animal eating some form of plant with sedgy edges to its leaves.

REMARKS ON MALIGNANT ŒDEMA.

This disease is essentially one of wound-infection, and around the seat of inoculation produces an extensive emphysema of the skin, putrefaction and œdematous softening of the superficial muscles.

During the progress of the disease the affected parts of the skin are usually swollen and crackle on pressure with the hand; the central portion is generally cool and relaxed, while all around the periphery it is somewhat tense and extremely painful.

In most cases death ensues in a few days; sometimes, however, the disease runs a fatal course in from twenty-four to forty-eight hours with very severe fever. The bacillus of malignant œdema has a very wide distribution in nature; in fact the disease can be produced almost at will by inoculating susceptible animals with garden earth, dust from between the planks of old flooring, decomposing animal and vegetable matter, and foul water. After the death of the animal the œdema bacilli can always be found in a flourishing condition, and reproducing their species in the tissues around the seat of inoculation.

These bacilli take the stain (methylene blue or gentian violet) very readily, and appear as somewhat slender rods with distinctly rounded ends. The majority of the rods are short, but occasionally they tend to unite end to end, forming long threads which are frequently curved or twisted upon themselves.

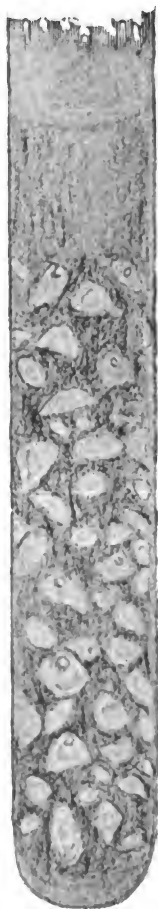
In the serous effusion of the affected tissues, and also in fluid cultures, the bacilli are distinctly motile; in fact, by a special staining process extremely delicate lateral flagella have been demonstrated. Occasionally in some specimens from diseased tissue the formation of endospores can be observed. The spores are seen as bright refractile oval-shaped bodies, and during their development within the parent cell the bacillus cause the latter to appear spindle-shaped.

A somewhat remarkable feature of the malignant œdema bacilli is that they are anærobic—i.e., they grow and multiply only in the absence of oxygen; hence the reason why they are not found in the general blood circulation of an affected animal during life, but some time after, when all the free oxygen has disappeared, they may be found in any of the internal organs, and also in any of the tissues situated farthest from the seat of inoculation.

If a tube of nutrient agar-agar, to which glucose has been added to reduce the oxygen, be inoculated with the bacilli, the growth will be restricted entirely to the lower part of the culture media, and will appear as a cloudy mass with an abundant development of gas bubbles which possess a decided peculiar disagreeable odour. The continued formation of gas causes the agar jelly to break up into irregular-shaped masses. In all solid media the bacilli grow as short rods and readily form spores, while in fluid media they frequently grow out into long filaments and are invariably motile.

The bacillus of malignant œdema has been proved to be pathogenic experimentally for mice, guinea-pigs, and rabbits, and naturally for cattle, horses, sheep, pigs, goats, chickens, and pigeons. It is worthy of mention that, although the smaller experimental animals usually succumb to the infection, the larger animals (horses and cattle) frequently recover.

There are no very conspicuous *post-mortem* appearances in the animals dead of malignant œdema beyond those found near the seat of inoculation—viz., extensive inflammatory œdematous condition of the subcutaneous connective tissues and surrounding muscles, bloodstained serous effusion, and a quantity of gas bubbles, which give rise to the offensive odour. The heart, lungs, spleen, and kidney each have a normal-looking appearance. In mice that have died of malignant œdema, the spleen is considerably enlarged, dark in colour, and the specific bacilli are invariably present. In these little animals the bacilli find their way into the blood during the last hours of life, and they are readily detected in cover-glass preparations of blood from superficial vessels of the heart and from the spleen pulp.



Bacillus of Malignant Edema growing in Glucose Agar-Agar, showing Formation of Gas Bubbles.

It often happens that when animals are inoculated naturally with malignant *œdema bacilli*, they are simultaneously introducing into the tissues a number of other micro-organisms which, being aerobic, afford greater facilities for the development of the *œdema bacilli*, hence the importance in the case of a valuable animal being infected to open the wound, and after thoroughly disinfecting the same with 1-20 carbolic solution, leave it exposed free to the atmosphere.

IMMUNITY.

It has been shown that animals which recover from malignant *œdema* invariably remain immune, while the exhaustive experiments of Roux and Chamberland have proved that immunity may be produced in susceptible animals by injecting filtered cultures of the malignant *œdema bacillus*, or by the injection of filtered blood serum of animals that have died of the disease. The chemical substances in the filtrate, when injected into susceptible animals, cause a transitory illness proportionate to the amount injected, and at the same time conferring immunity against the inoculation of virulent bacilli.

The results, however, from a stockowner's point of view, are not very satisfactory, inasmuch as the animal to be protected would require to be injected daily for at least ten consecutive days with large quantities of the filtered cultures, and even then the immunity produced is of only short duration.

One most important point of interest with reference to the disease is that, unlike anthrax, it never appears in the form of an epidemic; the reason being that while in anthrax the introduction of a single bacillus into the body of a susceptible animal may bring about fatal consequences, it is necessary, in order to produce a fatal form of malignant *œdema*, that the animal be inoculated with, so to speak, a large number of specific bacilli.

General Notes.

AUSTRALIAN CHAMPAGNE.

VICTORIA is steadily progressing in the manufacture of champagne. Not many vigneronns are engaged in the industry, but those who have undertaken it have, with great wisdom, engaged the services of experts from France, who, after considerable difficulty in adopting the peculiar and delicate manufacturing process to the peculiarity of local conditions, have achieved much success. Very satisfactory results have been obtained by Mr. Hans W. Irvine, of the Great Western Vineyard, situated 139 miles from Melbourne. He has successfully dealt with the climatic conditions, having excavated cellars in the granite 25 feet below the surface, where the temperature rarely rises above 50 degrees Fahr. all the year round. Mr. Irvine commenced to make champagne about nine years ago. In the cellars there are now 150,000 bottles; and 48,000 bottles of the 1896 and 1897 vintage are being added to the stock. This industry, which has also been commenced some years ago by Mr. Childs at Nudgee (Queensland), promises in the near future to prove an important branch of Australian wine-growing.

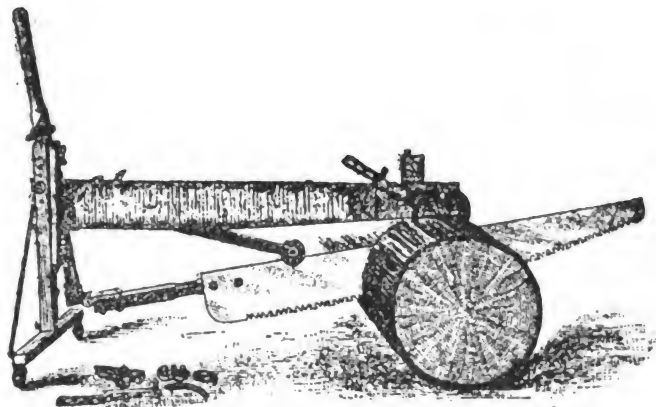
HOP-GROWING IN VICTORIA.

CERTAIN portions of Victoria appear to be eminently adapted to the growth of the hop plant, and for many years the industry has had a checkered career, the question of labour having proved so far a matter of some difficulty owing to the limited population. Hops are exported principally from Victoria to the neighbouring colonies, and are grown to some extent upon the fertile river flats of Gippsland on the east, on the banks of several tributaries of the Murray on the

north-east, and in the Otway forest on the west. There are 791 acres of hop gardens in Victoria, and 128 growers. The average yield is 15 cwt. per acre, although yields of 1 ton have been recorded. In the hop districts, the school holidays are given during the picking season, to enable the growers to avail themselves of the services of the school children.

FOLDING SAWING MACHINE.

In the April number of the *Journal* we described a folding sawing machine, and have since been asked by persons interested in timber-getting to illustrate it. This we are now enabled to do.



As we stated (quoting the southern journals) any man accustomed to the machine here illustrated, for which, by the way, Messrs. James McEwan and Co., Elizabeth street, Melbourne, are agents, can unfold it, arrange it for sawing down a tree, change to the position suitable for log-sawing, or fix it so that it can be used on a hillside. It saws down a tree at from 4 inches to 27½ inches above ground.

No matter how rough the ground around the tree may be, the saw can be immediately adjusted to meet the case. It almost entirely obviates the use of the axe, is easy to carry about as it folds up as completely as a pocket-knife, and saves backache when being used.

HOW TO EXTRACT A SPLINTER.

If a splinter is too small or too deeply imbedded to be got at with a pair of tweezers, the following simple method of extracting it may be tried. It has been found specially useful where children are concerned. A wide-necked bottle is filled with steaming hot water nearly two-thirds up to the neck. Then place the mouth of the bottle over the sore where the splinter has entered, pressing it firmly over the skin to create suction. The steam from the hot water will allay the inflammation, and at the same time assist the suction of the bottle to withdraw the splinter. Usually the steam and suction will draw out a splinter that has been driven in so deep that nothing less than a severe cutting of the flesh would ordinarily accomplish.

DESTRUCTION OF ANTS.

AMONGST the best substances to repel ants from the house is corrosive sublimate. The corrosive sublimate may be brushed along the floor where the ants enter, or strings may be dip into it—carpet rags do well—and laid along where they will obstruct the ants' path. The ants seem so averse to this substance that they leave at once. Dusting with the bubach also clears them out, but the treatment may have to be repeated every week or two.

HOW TO GET RID OF RATS.

TAKE a large earthen jar and set it in the ground near a building frequented by rats. The top should not be more than an inch or two above the surface of the ground. Fill this to within about 5 inches of the top with bran. Place boards over it, but leave a crack wide enough for a rat to easily enter. Let this set for several days and nights, until the rats have got into the habit of visiting it. Then take out the bran and fill with water to within 6 inches of the top, and on this sprinkle a covering of bran about 2 inches thick. Cover as at first, and every rat that has been in the habit of visiting the jar will unhesitatingly jump in, and once in there is no escape for him. He sinks, and the floating bran hides him from sight of the next victim. By once more filling the jar with bran and leaving it for several days before filling again with water, suspicion will be diverted. If there is no convenient place for setting the jar in the ground where it will not be disturbed, good results may be secured by placing a board in such a position that the rats can easily climb into the jar.—J. L. Irwin, in the *American Agriculturist*.

SULPHATE OF COPPER.

CONSIDERABLE complaints have been made that the prevalence of bunt in wheat crops where the seed has been pickled was due to the use of adulterated bluestone rather than to faulty methods of pickling. Similar complaints were made in Victoria; consequently the Department of Agriculture had samples sent in from various parts for analysis. Mr. A. N. Pearson, the Government Agricultural Chemist, now reports that in the majority of cases the percentage of sulphate of iron in the samples did not exceed 1 per cent., and in only one instance was it any way near 2 per cent. This is considered to be satisfactory evidence that the non-success of pickling cannot be attributed to inferior bluestone, and there is little doubt the same applies to the other colonies.

THE DIVINING ROD.

COMPARATIVELY few people in Queensland have had an opportunity of testing the efficacy of the divining rod as an indicator of the presence of subterranean water; and because they have had not seen experiments made, they are inclined to doubt, and to set down the experimenters as harmless lunatics inclined to spiritualism, palmistry, and the Obeah woman of Africa. As a matter of fact, there are many persons who are so constituted that the divining rod in their hands never fails to point to the spots where water may be obtained at a greater or less depth. It has been said that Moses obtained the water in the desert for the children of Israel by employing this method. However that may be, it is quite certain that water has been found in places where none was suspected in various parts of the world by this simple means, and there are at this moment people in Queensland who have been very successful in this direction. As for the rod itself, it consists merely of a forked stick of hazel, willow, or peach. Indeed, it matters little from what timber the rod is taken, although some years ago it was thought that nothing but hazel was effective. The simplest description one can give of the rod is that it resembles a boy's catapult, but is larger, although not much thicker. The best form of rod is a forked stick of some such timber as peach or wattle.

The main stem should be about $\frac{1}{2}$ -inch in diameter, and from 8 to 10 inches long, the two forks long enough to allow each to rest on the hips when grasped by the hand. The fork having been prepared, all that remains to be done is to walk slowly over the ground, holding the fork in the position indicated. Now it must be observed that all persons have not the faculty or power for discovering water by this means. The word "medium" appears to savour of spiritualism, but it is an undoubted fact that certain persons have failed to find water, where at the same time others, using the same rod, have been successful. There are, we are told, people who make a good living by discovering water when no surface water is available.

Now what happens when the right person wields the rod is this: On his reaching a spot beneath which water is to be found, the rod at once begins to turn downwards, and does so with considerable force. On the operator moving away from the place, the rod resumes its horizontal position, pointing straight ahead of the holder, and it will remain in this position until another hidden spring causes it again to deflect towards the ground. Cases have occurred in which water has been found by a person holding an iron rod across the palm of his hand, and even a pliable stick bent in the form of a bow has assisted the operator as well as if the rod had been forked.

WARTS ON TEATS.

It is stated that an effective and painless cure for warts on the cows' teats is the application of castor oil. The fingers should be smeared with oil and the affected teats rubbed gently every day for a few weeks. Then rub the udder with oil so that it runs down along the teats.

SEED WHEAT.

A FARMER in South Australia (Millicent) is said to have proved that 96 per cent. of hand-cleaned wheat will germinate, whilst only 36 per cent. of grain from the steam thresher will grow.

WEEDS ON GARDEN PATHS.

To destroy weeds on garden paths make a solution of 1 lb. arsenic and 2 lb. washing soda in 1 gallon of water. Boil for half-an-hour stirring all the time till dissolved. Half a pint of this solution should be mixed with each gallon of water and applied by means of a watering-pot.

THE NURSE ROOT SYSTEM.

THE *Pacific Rural Press* describes as follows the system of propagating trees from cuttings with the aid of nurse roots. It is of especial interest in the relation it bears to the important discovery claimed by Secretary Lelong, of the California State Board of Horticulture, as to propagation by aid of "mother roots":—

If you take a cutting of almost any kind and make a side cut upwards a little above its base, and insert in this cut a piece of the root of the same kind of a plant cut with a wedge shape at the top so as to fit closely in the cut in the cutting, this root will quickly callus itself to the cutting, send sap into it and start its growth. If the cutting were planted without this "starter" root, all the moisture might evaporate from its tissues (which is death to a cutting) before it can establish roots of its own to supply it sap. Thus this root piece becomes a nurse to the cutting until it is able to take its own nourishment, as it soon will by means of roots emitted from its own tissue. There is no recent discovery about this. It has been known for generations and has been employed in the propagation of all sorts of plants. It is simply one of the many forms of root grafting. If it is desired that the cutting grow upon its own roots alone, it is taken up at the end of the first season's growth and the nurse root is cleanly cut out and the well-rooted cutting is replanted. If it does not matter whether it grows upon its own roots and the enlargement of the nurse root (which is generally the case) it is allowed simply to go ahead as it likes. All roots on root grafts are nurse roots, more or less, because in almost any underground grafting you will have roots from the scion unless you take pains to replant with the whole of the scion or cutting above ground. This work can be done with cuttings of greater or less maturity. If you take last year's wood from a bearing tree you will, of course, get fruit in a year probably. If you take a cutting from a tree not yet in bearing you will have to wait longer. The speed of fruiting will be conditioned upon the age of the tree, and its habit of bearing upon wood of one or two years' maturity.—*Farm and Home*.

CATTLE DIPS.

As many inquiries have been made as to the ingredients used in dipping for the destruction of the cattle tick, Mr. P. R. Gordon, Chief Inspector of Stock, supplies the following formula of three dips in extensive use in the Central and Southern districts :—

ARCHER'S.

1½ lb. arsenic

3 „ soda

3 „ soap

Per 100 gallons of water.

CHRISTIAN'S.

23 lb. soda ash

8 „ arsenic

7½ gallons Stockholm tar

Per 400 gallons of water.

BOOKER'S.

23 lb. washing soda

8 „ arsenic

12 „ soap

7½ gallons Stockholm tar

Per 400 gallons of water.

Boil for six hours, then add one tin of kerosene to 470 gallons of the mixture.

AMOUNTS OF PHOSPHORIC ACID, NITROGEN, AND POTASH ANNUALLY REMOVED FROM ONE ACRE BY VARIOUS CROPS.

| Crop. | Grains. | Straw. | Chaff. | Phosphoric Acid. | Nitrogen. | Potash. |
|---------------------|--------------------|-------------------------------|------------------|------------------|-----------|---------|
| | | | | Lb. | Lb. | Lb. |
| Wheat | 35 bushels... | 2,700 lb. | 300 lb. | 24 | 59 | 31 |
| Rye | 30 „ | 4,000 „ | 250 „ | 26 | 51 | 45 |
| Barley | 40 „ | 2,300 „ | 390 „ | 21 | 46 | 38 |
| Oats | 60 „ | 2,900 „ | 275 „ | 22 | 55 | 62 |
| Corn | 50 „ | 4,100 „ | 950 „ cobs ... | 31 | 67 | 80 |
| Buckwheat ... | 30 „ | 2,200 „ | ... | 30 | 35 | 9 |
| Potato | 200 „ | 1,450 „ leaves and stubble | ... | 21 | 46 | 74 |
| Sugar beets ... | 15½ tons ... | 3 tons | ... | 32 | 69 | 143 |
| Mangel-wurzel ... | 22 „ | 6 „ | ... | 46 | 150 | 264 |
| | GREEN. | DRY. | | | | |
| Meadow-hay ... | ... | 2½ tons ... | ... | 23 | 83 | 85 |
| Timothy | 6 tons | 2 „ | ... | 32 | 89 | 94 |
| Green corn ... | 11½ „ | ... | ... | 46 | 85 | 164 |
| Red clover in bloom | 8 „ | 2 tons | ... | 28 | 105 | 96 |
| Lucerne | 8 „ | 2 „ | ... | 26 | 113 | 71 |
| Crimson clover ... | 7 „ | 1½ „ | ... | 11 | 60 | 36 |
| Sugar-cane ... | 20 „ | ... | ... | 15 | 153 | 44 |
| Sorghum | 15 „ | ... | ... | 24 | 121 | 153 |
| Cotton | 750 lb. seed... | 250 lb. lint ... | ... | 9 | 26 | 10 |
| Hops | 600 „ strobile | 1,200 „ leaves | 1,500 lb. Ramber | 23 | 84 | 53 |
| Tobacco | 1,600 „ leaves | 1,300 „ stems... | ... | 23 | 89 | 103 |
| Grapes | 2 tons grapes | 1½ T. tops ... | 2 tons wood... | 11 | 32 | 39 |
| Cabbage | 31 „ heads ... | ... | ... | 88 | 150 | 360 |
| Cucumber | 25 „ | ... | ... | 30 | 86 | 116 |
| Onions | 1½ „ | ... | ... | 37 | 72 | 72 |
| Oranges | 20,000 lb. (fruit) | ... | ... | 16 | 24 | 103 |

SWEET POTATOES.

WE lately saw sweet potatoes being planted for the third time in succession on the same land. This is unquestionably bad farming. The only soil in which sweet potatoes develop their best qualities and attain the largest size is a sandy or volcanic soil, in which there is not an over-abundance of nitrogenous matter. The tuber does well after a cleanly cultivated corn crop. When potatoes have been grown year after year on the same land, and the vines left to decay thereon, the soil is said to become "potato sick." A heavy dressing of potash and phosphoric acid overcomes the sickness, but it is best to grow some other crop on the land for a while; 550 lb. per acre of a fertiliser containing available phosphoric acid, 7 per cent.; potash, 9 per cent.; nitrogen, 4 per cent., will give good results.

STABLE MANURE.

MIXED stable manure contains nitrogen, ammonia, potash, phosphoric acid, and lime. When allowed to decompose by exposure to the air, it loses a portion of its nitrogen in the form of volatile ammonia. This loss can be prevented by scattering kainit over the surface of the manure heap as it accumulates. The amount of kainit which should be added to fresh stable manure to prevent loss of ammonia through heating, is 1 lb. per day for each cow or horse, or for eight head of sheep. The kainit will save more than its cost in the value of the nitrogen which it retains, and will possess its original value as potash food.

The annual products of the farm (grain, grass, roots, milk, &c.) remove from the soil large quantities of nitrogen, potash, and phosphoric acid. A portion of these food elements is returned to the soil in the form of stable manure, but the remainder have been lost, and the productive capacity of the farm can only be maintained by the use of commercial fertilisers.

To illustrate this fact, let us suppose a farm, on which, during three years, crops of wheat, potatoes, and corn have been raised, and where 26,700 lb., or about 13½ tons, of stable manure has been applied per acre. An examination of the composition of the crops removed and of the manure applied will show the following decrease in fertility at the end of the period:—

| Crops. | Potash. | Phos. Acid. | Nitrogen. |
|---|---------|-------------|-----------|
| | Lb. | Lb. | Lb. |
| Wheat, 30 bushels (1,802 lb. grain, 2,671 lb straw) ... | 30 | 22 | 44 |
| Potatoes, 300 bushels, 16,800 lb. | 97 | 26 | 57 |
| Corn, 12 tons, 24,000 lb. | 79 | 36 | 98 |
| Total plant food removed... | 206 | 84 | 199 |
| Total plant food supplied by 13½ tons stable manure ... | 168 | 69 | 134 |
| Total loss of plant food ... | 38 | 15 | 65 |

The tops or vines of field potatoes are so seldom removed from the field, that they are here considered as having been returned to the soil.

LARGE TREES.

THE largest tree in the world is to be seen at Mascali, near the foot of Mount Etna, and it is called "the Chestnut-tree of a Hundred Horses." Its name rose from the report that Queen Jane of Aragon, with her principal nobility, took refuge from a violent storm under its branches. The trunk is 20½ feet in circumference. The largest tree in the United States, it is said, stands near Bear Creek, on the north fork of the Tule River, in California. It measures 140 feet in circumference. The giant redwood-tree in Nevada is 119 feet in circumference.—*Ladies' Home Journal*.

AN OLD ORANGE-TREE.

THE oldest orange-tree in France has just died ; this is an item recently found in the "Press Miscellany." If true, it is interesting as showing the very great age to which an orange-tree may attain under favourable conditions. The details as published are as follow :—

It was brought to France with several others in 1421, by Queen Leonore of Castile, the wife of Charles III. of Navarre, and in 1684 Louise XIV. ordered that it be transplanted to the orange grove in Versailles, and there it has remained ever since. During the last two centuries the tree has been known as the "Grand Bourbon," and for many years every possible care has been taken to preserve it from decay. Now it has passed away at the great age of 478 years, and many Parisians who knew it well are sorry that they will never again see this stately ornament of the Versailles Gardens.

BUTTER AND MALTING BARLEY.

DURING last year 436 tons of butter, valued at £37,586, were exported from Queensland.

In 1898 the malt and malting barley imported into Queensland was of the value of £46,000.

PRICE OF MAIZE.

MAIZE, owing to the shortage of shipments from America, has risen to 4s. per bushel, and unless supplies come from some unexpected source a further advance may be confidently looked for. In the face of this, on the 13th October, in Sydney, 1,138 sacks of New York maize were sold with all faults by auction in one lot. The lot was knocked down for 8s. ! The sacks averaged about 3½ bushels each.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR SEPTEMBER.

| Article. | | | | | | | | SEPTEMBER. | | |
|-------------------|-----|-----|-----|-----|-----|-----|-------|-------------|----|-----|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bacon | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 7 |
| Bran | ... | ... | ... | ... | ... | ... | ton | 6 | 3 | 9 |
| Butter, First | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 11½ |
| Butter, Second | ... | ... | ... | ... | ... | ... | " | 0 | 0 | 7½ |
| Chaff, Mixed | ... | ... | ... | ... | ... | ... | ton | 3 | 13 | 9 |
| Chaff, Oaten | ... | ... | ... | ... | ... | ... | " | 4 | 8 | 9 |
| Chaff, Lucerne | ... | ... | ... | ... | ... | ... | " | 3 | 15 | 0 |
| Chaff, Wheaten | ... | ... | ... | ... | ... | ... | " | 2 | 11 | 3 |
| Cheese | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 5½ |
| Flour | ... | ... | ... | ... | ... | ... | ton | 9 | 1 | 3 |
| Hay, Oaten | ... | ... | ... | ... | ... | ... | " | 3 | 16 | 3 |
| Hay, Lucerne | ... | ... | ... | ... | ... | ... | " | 2 | 18 | 9 |
| Honey | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 1½ |
| Rice | ... | ... | ... | ... | ... | ... | ton | 11 | 17 | 6 |
| Maize | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 7½ |
| Oats | ... | ... | ... | ... | ... | ... | " | 0 | 3 | 3 |
| Pollard | ... | ... | ... | ... | ... | ... | ton | 6 | 0 | 0 |
| Potatoes | ... | ... | ... | ... | ... | ... | " | 4 | 0 | 0 |
| Potatoes, Sweet | ... | ... | ... | ... | ... | ... | " | 1 | 11 | 3 |
| Pumpkins, Table | ... | ... | ... | ... | ... | ... | " | 1 | 17 | 6 |
| Sugar, White | ... | ... | ... | ... | ... | ... | " | 14 | 10 | 0 |
| Sugar, Yellow | ... | ... | ... | ... | ... | ... | " | 12 | 10 | 0 |
| Sugar, Ration | ... | ... | ... | ... | ... | ... | " | 10 | 5 | 0 |
| Wheat | ... | ... | ... | ... | ... | ... | bush. | 0 | 3 | 3½ |
| Onions | ... | ... | ... | ... | ... | ... | cwt. | 0 | 9 | 3 |
| Hams | ... | ... | ... | ... | ... | ... | lb. | 0 | 0 | 9½ |
| Eggs | ... | ... | ... | ... | ... | ... | doz. | 0 | 0 | 5½ |
| Fowls | ... | ... | ... | ... | ... | ... | pair | 0 | 4 | 3½ |
| Geese | ... | ... | ... | ... | ... | ... | " | 0 | 6 | 7½ |
| Ducks, English | ... | ... | ... | ... | ... | ... | " | 0 | 4 | 10 |
| Ducks, Muscovy | ... | ... | ... | ... | ... | ... | " | 0 | 6 | 4½ |
| Turkeys, Hens | ... | ... | ... | ... | ... | ... | " | 0 | 8 | 0 |
| Turkeys, Gobblers | ... | ... | ... | ... | ... | ... | " | 1 | 6 | 0 |

ENOGGERA SALES.

| Article. | | | | | | | | SEPTEMBER. | | |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-------------|----|-----|
| | | | | | | | | Top Prices. | | |
| | | | | | | | | £ | s. | d. |
| Bullocks | ... | ... | ... | ... | ... | ... | ... | 6 | 17 | 6 |
| Cows | ... | ... | ... | ... | ... | ... | ... | 5 | 0 | 7½ |
| Wethers, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 15 | 0 |
| Ewes, Merino | ... | ... | ... | ... | ... | ... | ... | 0 | 11 | 1½ |
| Wethers, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 16 | 0 |
| Ewes, C.B. | ... | ... | ... | ... | ... | ... | ... | 0 | 14 | 11½ |
| Lambs | ... | ... | ... | ... | ... | ... | ... | 0 | 13 | 11½ |
| Porkers | ... | ... | ... | ... | ... | ... | ... | 1 | 8 | 0 |
| Slips | ... | ... | ... | ... | ... | ... | ... | 0 | 9 | 6 |

Orchard Notes for November.

By ALBERT H. BENSON.

THE earliest varieties of Summer fruits will be ready to market during November; and as this is the beginning of the season, I beg to call the special attention of every fruitgrower in the colony to the importance of gathering and destroying all fly-infested fruits now if he wants to save any crop at all, as the neglect to destroy the first crop of flies will result in the loss of the succeeding crops of fruit. It is impossible to over-estimate the importance of destroying the early crops of fruit flies, as if left alone they breed so rapidly that the fruit crop is soon infested and destroyed.

The best way of destroying the first crops of flies is to gather and boil all infected fruit; such fruit, when boiled, to be fed to pigs or other animals. Feeding the fruit without boiling will result in the escape of a number of the maggots, and is therefore undesirable, besides being contrary to the Regulations of the Diseases in Plants Act.

Every fruitgrower should make it his business to see that his orchard is kept free from this pest, and not only his own orchard, but that his neighbours keep their trees free as well. All useless trees, such as inferior seedling peaches, guavas, &c., growing by hedge or fence sides, should be destroyed, as the fruit is valueless, and only becomes a harbour and breeding-ground for the fly. Unless fruitgrowers take action—combined and systematic action—to deal with this pest, it will never be kept in check; and for such action to be effective it is best to destroy all trees that produce unsaleable fruit, and to concentrate one's energies in keeping such trees clean that produce fruit of such a quality that it will command a ready sale. The marketing of fruit is a matter also that requires much more care and attention than is usually bestowed upon it. In many instances really good fruit is completely spoilt by carelessness in gathering, handling and marketing, and is consequently valueless: whereas had it been carefully gathered, properly graded for size and ripeness, and packed in such a manner that it will carry well without bruising, and when opened up show to best advantage, it would have realised a satisfactory price. First-class fruit always pays to be well handled and well packed, as for such fruit there is always a good demand; but for badly handled, undersized, and bruised fruit there is little if any demand—at any rate, at remunerative prices. First-class early peaches, such as the Alexander or Brigg's Red May, grown on the Downs, would pay to be carefully wrapped in tissue paper and packed in trays holding one layer of fruit, as, if marketed in such a manner, they could be placed on the Brisbane market in first-class condition, and would realise good prices. First-class apricots, such as the Moorpark, would also pay to be handled in the same manner. Fruitgrowers should bear in mind that the better condition in which they market their fruit, and the more attractively it is got up, the better the chance of its realising a satisfactory price.

During the month, the Orchard should be kept well cultivated, especially in districts where the rainfall is light; and in such districts, if water is available for irrigation, a good watering should be given to all fruit trees and vines. By a good watering I don't mean damping the surface, but giving the soil a thorough soaking, as one good watering is worth a dozen small ones. Attend to the summer pruning of all young trees, removing any superfluous branches and pinching back all strong growths. Attend to the cultivation of the nursery; stake all grafts or buds, so as to produce straight, well-grown trees, the bud or graft being topped at the height that it is wished to form the head of the future tree.

Farm and Garden Notes for November.

CONSTANT attention should now be given to crops to keep them clean and to keep the ground loose. Under favourable circumstances, harvesting can commence in some districts. Where the heavy frost of October destroyed the wheat crops for grain, the land will, in many cases, have been ploughed after taking off the damaged wheat for a hay crop, and sown with maize. With seasonable showers the crop should go a long way towards recouping the severe losses entailed by the frosts. Oats should be cut for hay when mature but not ripe, as the plant is then in its most nourishing state. Tobacco plants will require careful watching to prevent the ravages of caterpillars. Top the plants back so as to direct the full strength into the leaves intended for crop. Sow imphee, setaria, or panicum, teosinte, sorghum, maize, Kafir corn, and generally sow as directed for last month, with few exceptions.

Kitchen Garden.—The benefit of well-trenched ground will become more apparent as the season advances. Shallow-worked land will not repay labour expended on it, unless it is well mulched with manure, &c. In sowing and transplanting during the summer months allow plenty of room, or the crops will be drawn and worthless. Good, deep, and constant cultivation will always pay in the kitchen garden. Keep the ground clean and open with the digging-fork and hoe. Thin out melon and cucumber plants, and loosen the earth round them. It is a good plan, and will save much of the crop if the branches are pegged down as they extend. This will prevent them being destroyed by high winds, and by so doing they will take root, and therefore ease the main root. Tomatoes planted out last month should be well watered and mulched during the prevailing dry weather. Sow cabbage, French beans, melons, lettuce, radish, pumpkins, cucumbers, rosellas, &c. Transplant for succession in calm cloudy weather.

Flower Garden.—In many gardens dahlias are well above ground, and should be staked. Bulbs which were put away in a moist spot may now be planted out. Reserve the weaker bulbs for later planting, so as to ensure flowers for autumn. Bulbs that have done flowering should be taken up and stored for the season in a dry place. The flower garden should now be in full bloom, and will well repay the trouble bestowed on it, and a little fertiliser of any description given as a top-dressing will assist the plants to bloom and look well for a longer period than with ordinary treatment.

Horticultural Notes.

By PHILIP MAC MAHON,
Curator, Botanic Gardens, Brisbane.

WHEN this meets the eye of the most distant reader of the *Journal*, we shall be well into the month of November, one of the hottest months of the year in Queensland, and, so far as mortals are concerned, one of the worst to bear, because coming directly after our glorious winter. The mean shade temperature, as shown in our table at the commencement of these articles, is 75 degrees, and the average rainfall amounts to the not large amount of 4.06 inches, which is small compared to the average annual rainfall of the next month, December, which amounts to 10.21 inches, and this no doubt accounts for the reduced

temperature of December, the mean of which is 73 degrees. It would be interesting to copy the table of temperatures and rainfalls given at the commencement of these papers and consult it from time to time, which can be done all the more readily if it is hung in a convenient place. As this is written, we are passing through a time very trying to vegetable life, owing to the lack of rain or of humidity in the atmosphere. There is a great temptation for those who can command large supplies of water at such a time to administer it without judgment, and in this way a good deal of harm is done in the endeavour to come to the rescue of our plants. When there is drought in the land, Nature attunes herself to the condition of affairs, and, so far as a garden is concerned, more harm is often done at such a time by overwatering than by not watering at all. Quite often you see plants stimulated into growth for a little time by copious supplies of artificially applied water, and then abandoned to their fate, which is the particularly miserable one of death from drought. As little water as will keep the plant going should be applied when the air is hot and sultry, and that should not be stopped all over the plant, but applied to the ground near the roots. It should be supplied sufficient at a time, and not often, and as soon as the land becomes slightly dry the ground should be gone over with the hoe or cultivator to produce a layer of pulverised soil between the moist earth below and the thirsty atmosphere above. Good cultivation in a great measure supplies the place of watering in weather like this. I do not mean the kind of cultivation which consists in allowing the roots to take possession of the surface soil, and then running a cultivator through it, tearing the tender rootlets and depriving the plants of so many mouths at one fell swoop, but of the steadily carried-out cultivation which never allows the surface soil to become consolidated, and which always keeps the surface of the ground in such a condition that you can turn it up with the toe of your boot quite easily. It would be a grand object lesson to a young man commencing agriculture to take two plots, and cultivate one with regularity and allow the other to be cultivated only at long intervals or irregularly. It may seem a simple thing to harp upon, but I have abundant reason for believing that the immense importance of always maintaining a loose surface on land does not receive half the attention it deserves.

In watering, it is, of course, best to do so in the early morning, or, even still better, very late in the afternoon. With the aid of irrigation—constant judicious irrigation—immense crops can be raised from plots of land which our selectors and farmers, with lordly ideas begotten of huge areas, would laugh at. I have seen ten times as much produce, both in quantity and value, taken off a piece of land which you could almost crack a stockwhip over than is taken off some farms in this colony where it is a morning's journey from one end of the cultivation to the other. True cultivation means the getting of the most money's worth off the smallest area of land with the minimum of expense in proportion to the crop. In a country liable to irregularity of water supply, more than in any other country, concentration of effort over as limited an area as possible should be seen to in the cultivation of such products as are likely to demand close attention at any period of their growth, because every rod which the cultivator has to walk unnecessarily is not only a loss so far as his personal exertion is concerned, but bears compound interest in the loss entailed in want of attention to his crop. I have in my mind's eye, at this moment, farms where there is water ever present, which the most elementary engineering, backed with a little "elbow grease," would send in cooling, vivifying streams over a parched land; and yet the cultivation is scattered here and there, and 20 acres produce what could be produced by one if attention were only concentrated on it.

Last month a good many tropical palms, &c., were planted out here, and these we will find it necessary to supply with water, but not so much as to force them into unnatural growth. It is well to have all such plants in a condition to take full advantage of the close warm weather which is coming, and so we shall just keep them alive until the rain and muggy atmosphere force them into growth, and then we shall let Nature take the work in hand, and, beyond

keeping down the weeds which always come on in this time of rapid growth, we shall let the palms, &c., alone. By the way, this dry weather is just the time to fight weeds. The great thing is to give them no chance to reproduce their kind. They must go down before your cultivator before they have any time to leave behind them others to carry on the vendetta against you. Unless you are just cultivating a few square yards, you have no time to waste with the ordinary hoe. Get a Planet Cultivator or an Avery Garden Plough, and learn how to use it. There is more in this learning than is generally thought. Nearly anyone will tell you, for instance, that he can use a spade. Now, men who can use a spade are rare. In rural England, a good many years ago, men prided themselves on their ability to use certain tools, but it is the rarest thing to hear a man now boast of his ability with agricultural tools. This is due to a sort of belief that in elementary matters like this there is nothing to learn. I have met with many men who had been through colleges and all the rest, and who could not rake a garden walk in a proper way, or handle a spade as it should be handled, to save their lives. If you want good lawns, topdress them before the rains and warm weather. A little sulphate of iron is a capital thing to mix with topdressing for lawns. It has the property of destroying moss and other rank-growing vegetation. Such plants take up a much greater proportion of water than grasses, especially of the finer kinds, and when too large a percentage of the sulphate is taken up the plant is destroyed, but in the proportion in which the finer grasses absorb it it acts as a valuable manure. It should be used in the proportion of $\frac{1}{4}$ -cwt. to the acre. It is good also in solution for watering lawns infested with moss or other rank growths when applied in the above proportion. In your garden, insects will feel the influence of the warm weather, and will increase rapidly in number, and as the succulent young leaves afford them congenial pasturage they will make themselves more and more at home. As you do not wish to emulate the example of that man who cut off his nose to spite his face, you will be a little chary about injuring the young growth of your plants for the sake of killing a few insects, but the moment you can do so with safety they must be tackled. It is even better to run some risk of damaging a few shoots than to let them forge ahead to any extent. No matter how carefully you have sprayed and washed your trees during the winter, insects are sure to come. With the dry wind comes the aphid, and after him, especially in dry warm weather, the red spider puts in an appearance. With cold damp weather you are sure to find mildew on your roses—this latter a fungus. Just as the warm weather is coming on, if you take a needle and raise one of the dead dry shields of the scale insect upon one of the leaves of a tree, you will find a perfect nest of very lively little insects—the young scale insects ready to emerge and make war on the tender foliage. They begin to stir just before the young foliage begins to come, and that is the time to make things lively for them. When they settle down, and, like the Spartan soldiers, erect their hard shields against the enemy, it is a much more difficult matter. The way we start a campaign against the foe here, is to take each plot by its consecutive number. (All the plots are numbered and laid down with respective areas, &c., upon a map.) We carefully examine all the plants, plot by plot, and decide what can best be cut away, what strength to use for different plants, &c. This is jotted down, and then each plot is dealt with consecutively, so that no plant which can be reached is missed. This will soon be done, and again after the lapse of about a week, so as to reach such of the enemy as have only been staggered by the first application.

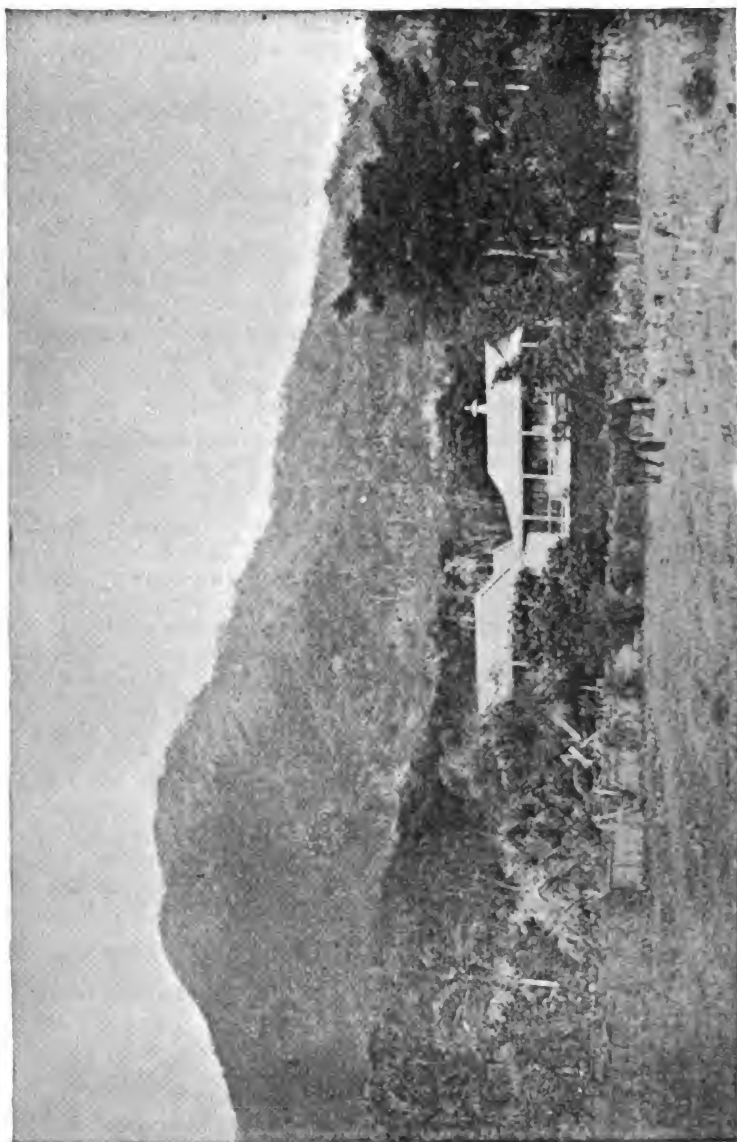
The methods of preparation of Bordeaux mixture, ammoniacal solution of copper carbonate, kerosene emulsion, *Eau celeste*, London purple, Paris green, &c., are, I fancy, well known to everyone into whose hands the *Journal* is likely to come. They have been published often enough. I like the plan of pasting these often-wanted recipes on a card, and hanging them up for reference, for they are just the sort of thing you cannot carry in your head; besides, you want your head for more important work.

In the outside garden you will find the winter flowering plants, such as the many varieties of annuals which made the garden so gay, are going off rapidly. We make a point never to leave these after they begin to look shabby. A plant on the down grade, too, is a favourite abiding-place for insects. There is nothing so effective in a garden during the summer as large masses of amaranthus. Last week we sowed, to be ready a little later, balsam, zinnia, *Gomphrena globosa*, summer asters, summer chrysanthemum, calliopsis, Drummondii, *Amaranthus bicolor*, nemopila, anthirrhinum, *Gaillardia* *Lorenzia*. Seed of many varieties of tropical plants which do not usually come within the operations of the ordinary gardener or amateur were also sown. Coffee seeds have been gathered and prepared for sowing.

Plants on verandas will require careful attention in the matter of watering now. If I were growing veranda plants in Queensland, I should plunge all the pots in neat boxes of fine ashes during this very hot weather. The plants would flourish better, and there would not be the same need for continual watering; besides, they could be very effectively grouped in this way.

THE



Plate CLII.

THE HOMESTEAD, STATE NURSERY, KAMERUNGA, CAIRNS.

Agriculture.

ABOUT EARLY AND LATE FROSTS AND OTHER TROUBLES.

By HENRY A. TARDENT,
Manager, Biggenden Experiment Farm

SAD news indeed flashed over Queensland on the mornings of the 2nd, 3rd, and 4th October last. A sharp frost had swooped over a large portion of the colony, injuring valuable fruit trees and grape vines, killing English and sweet potatoes, tomatoes, melons, pumpkins, and, what is worse still, doing great havoc amongst the waving wheatfields of the Downs. In most instances the wheats were precisely at the critical stage when the plant is most sensitive to cold, so that in many cases the crop of grain is irremediably compromised.

Many a farmer who had gone to bed full of hopes for a bounteous harvest woke up the following morning to find those hopes vanished like so many soap bubbles, and many a month of hard work rendered practically useless.

In view of such an extensive disaster, the question naturally arises: Is there any possibility of protecting our crops against it? At first sight it seems there is not. The meteorological phenomena themselves are, so far, beyond our control; still we should not give up all hopes. If we cannot prevent a wave of cold sweeping over the continent, we can at least dispute with it our crops in detail, inch by inch, so to say. To begin with, of recent years meteorology has advanced enough to be able to foretell a frost from 24 to 48 hours in advance. This is already an important point gained. A warning of such a length enables one to make some preparations for saving at least part of one's crop. Even those who are beyond the reach of Mr. Wragge's forecasts could have remarked that on Sunday, 1st October, the wind was blowing with considerable force from the west and south-west. At this time of the year this is a sure indication of an important fall of temperature, especially when the sky remains clear. Old residents are also well aware that nearly every year a more or less severe wave of cold visits the colony during the first fortnight in October. We should watch and be prepared for it. A couple of years ago I had, on the Westbrook Experiment Farm, on the 12th of October, a frost sharp enough to blacken the leaves of French beans.

Besides meteorology, other laws of Nature are being gradually discovered. That welcome knowledge helps us to cope with difficulties which appeared formerly insuperable. For instance, if your farm is situated in the neighbourhood of a hill, you will have remarked that towards the morning the cold is much more intense at the foot of the hill, in the hollow, along the bottom of the valley, than on the top. If you have not remarked it, at least your cattle did. If they have access to the hill, they will invariably, during a cold night, work their way up the top. This seems to prove that during the night, there is a double current of air between the low-lying and the higher situated places. The hot air (during the day the air is hotter in the valley) ascends the hill whilst the cold air descends from the top. Now, by establishing thick living hedges of privet, or African thorn, or even tree lucerne, or some more substantial breakwinds of taller trees, such as camphor laurels, *Pinus insignis*, &c., we can retard that double current, that exchange of hot and cold air, and thus improve, so to say, the climate of our farm.

When the work is well done, the temperature of a cold night may be improved by from 5 to 8 degrees, which is usually sufficient to prevent any harm being done by frost.

Again, if you will take the trouble to observe, were it only for one winter, two thermometers—one placed quite close to the ground, the other at a certain height above it, say, from 4 to 5 feet, you will find that on a clear frosty night the temperature is from 10 to 12 degrees *lower* close to the ground.

It follows that delicate plants such as tomatoes, grape vines, &c., are less liable to frost when trained on high stakes and trellises than when allowed to trail on the ground. It should not be forgotten that a good drainage, be it produced by artificial or by natural means, tends to keep warmth in the ground—that is, plants become more easily frozen on an ill-drained than on a well-drained soil. A good layer of mulch retards also terrestrial radiation of heat, and can be used with success on strawberry beds, on tomatoes, potatoes, &c. Pineapples can be saved by simply putting a handful of hay or straw over the heart of the plant. Bananas stand a good deal of frost when their bunches are enveloped in a bag or with straw. In fact, I have seen, as far west as Charleville (483 miles from the coast), in a Chinese garden, banana plants which had survived the winter there, and were bearing heavy bunches of fruit.

In places exposed to late frosts it is a good plan to retard spring vegetation. This is especially the case with the grape vine, and is now regularly practised with success by many of the best Roma vigneron.

Various means are used to reach that end. The spring ploughing is delayed as long as possible without exposing the vineyard to become a prey to weeds. The pruning is also deferred as late as can be without running the risk of having too much *bleeding*, as the running of the sap from the cut is called. But, above all, the surface roots are carefully removed and are never allowed to develop. That is, at the first pruning, after a year's growth, if you remove a bit of earth from around the collar of the vine, you will see usually from three to four roots radiating horizontally within a couple of inches of the surface. Cut them off straight away, thus inducing other roots to develop lower down in the ground. If you do not do that, you prepare yourself endless trouble. During a drought, or even during short periods of hot, scorching, January sun, the sap gets practically baked in those surface roots, and the plant—leaves, fruit, and all—wITHERS away, sometimes beyond redemption. In a wet season those surface roots are perhaps worse still. They absorb an extraordinary amount of water, more than the plant can elaborate and transform into nourishing sap. The results are yellow leaves, a sickly look, and tasteless, watery fruit. Those roots prevent you also from ploughing deep, depriving you thus of the principal condition of a good crop. But, above all, these roots predispose the plant to suffer from early frosts. Being so near the surface, they feel in the middle of the day the warmth of our sunny spring days. Although the nights are still cold, the sap is awakened and put into circulation, and the buds venture out of their warm, downy coverings by from a week to a fortnight earlier than would be the case with roots seated deeper in the ground. Such means apply, though to a less degree, to other shrubs and fruit trees, the vegetation of which can be accelerated or retarded at will by judicious management. That careful husbanding of the sap is indispensable to successful fruit and vine-growing.

Whilst I am still upon the subject of the vine, I might as well mention here that all hopes should not be given up even after a severe frost. When a couple of days have elapsed, which is quite sufficient to show you the whole extent of the damage, take your secateur and re-prune carefully every vine. In her wisdom—and kindness—Dame Nature has provided the vines with a spare or under bud (*faux-bouton*), which will now develop and not seldom give, in our climate, a fair crop of grapes.* Attend also carefully to the so-called summer pruning. After a frost, the vine, as well as other fruit trees, has a

* See article in this issue, page 576, on "The Effects of the Late Frosts on Vines," by Mr. E. H. Rainford, Viticulturist—Ed. Q.A.J.

tendency to grow bushy—that is, to emit a lot of small, thin, and stunted shoots. If you leave matters in that state you will not only rob yourself of this year's crop, but compromise also the crops of succeeding years. Keep rubbing off carefully those useless shoots, leaving only three or four in suitable places to reshape the vine stock and give you a good material for the following years' pruning.

Now, about plants growing close to the ground.

It has been remarked that a small rise of the soil gives a considerable protection to delicate plants. Taking advantage of that fact, the writer of these lines has planted successfully potatoes and other delicate crops as early as July in some of the coldest places of the colony, such as Roma and Westbrook. The plan is to plant or sow at the bottom of a drill 6 or 7 inches deep, usually opened with the plough, and to cover slightly with a couple of inches of earth only. As the plant grows, bring more earth towards it, and let it fully develop only when all danger of frost is over. This method of planting (which I can also recommend for the spring crops of maize and sorghums in the *dry* districts of the colony) is not only an excellent safeguard against frost, but it helps also greatly to counteract the effects of a drought. The plant is practically hilled up, though the land remains flat. This protects the roots from sun heat, and keeps the moisture in the ground much more effectively than the old method of hilling up potatoes and maize.

Do not limit yourself to the above preventive means, good as they are. At the slightest sign of a frost, rise up early—say between 4 and 5 a.m.—and start at once making smoke with anything handy, such as wood heaps covered with green leaves or grass, old cornstalks, old, useless, and, if possible, wetted straw, &c. Tar is still better, as it gives a thick dark smoke, forming an excellent protection, and it is not expensive either. You will remark that at sunrise there is usually a change of direction in the light morning breeze. It will be sometimes sufficient to take your artificial cloud away just at the time when it is most wanted, and carry it to your lazy neighbour, whose crops are thus saved whilst he is sound asleep in his bed. To obviate that inconvenience, take three light boards, make of them a small hand sledge, cover it with some sheet-iron, fix on it an old oil drum with a small opening on one side towards the bottom, such as plumbers use to heat their soldering irons. Put in it a good provision of embers and charcoal, and on them anything smeared with tar, such as corn-cobs, chaff, straw, &c. Now draw your sledge on the side of the field where it is wanted. In less than half-an-hour you will find that the whole country—especially if it is a hollow, a plain, or the bottom of a valley—is covered with a fine artificial cloud, hanging like a horizontal curtain at a small distance from the soil. This will be perfectly sufficient to prevent any damage from frost as long as the thermometer does not fall below 5 or 6 degrees of frost on the ground. In Switzerland, where solidarity and co-operation are more developed than in these colonies, it is not unusual to see the municipal corporations, or what we would call here the divisional boards, prepare in advance burning materials at given places, and have them lighted as soon as the thermometer drops to a certain degree. By that means the vineyards and other valuable crops of whole parishes—nay, of whole districts—are saved from destruction. Here in Queensland, nine times out of ten, that simple and inexpensive means would be sufficient to save our crops where the thermometer very seldom falls below a few degrees of frost. I have used it successfully nearly every year for the last ten or twelve years, and at the moment of writing I have before me a letter informing me that on my own farm, in the Roma district, the crops have again been saved by it during the last frost, whilst nearly every other place in the district has more or less suffered. I read also in the *Australasian* that Mr. Dubois, the energetic viticulturist of the Dookie College, in Victoria, has saved his vines by it.

Should the thermometer fall below 6 degrees of frost, that is, below 26 degrees Fahr., we should not avow ourselves beaten yet. As is well known, it is not so much the frost as the thawing which does the harm. It is not yet quite

well explained whether the tissues of the plants are, so to say, cooked by the first rays of the sun falling on them, or whether perhaps, it is not the evaporation which increases the cold at that very moment. Anyhow, we know that the plants do not suffer when the thawing can be done artificially before the sun rays fall on them. For that purpose potted plants are brought under a shed and kept in a dark place for a day or two. Plants in the open can be covered with bags, bales, straw, cut gourds and calabashes, and where convenient they are simply covered with earth by running along the rows the Planet Junior, with the mouldboards turned inside as indicated in my article on tomatoes, December, 1897. For large fields two men on foot or on horseback hold each one end of a long rope or wire, and run it along the crop thus, shaking off the white frost from the plants. In that way whole fields of potatoes, Nepal barley, and young tender wheats might have been saved on the Downs at the beginning of October.

During the last winter I have tried here at Biggenden two other means, of which one, at least, succeeded remarkably well—water and powdered quicklime.

On the 1st of July we had, on the Experiment Farm, 13 degrees of frost on the ground (19 degrees Fahr.) I saw that smoke would not be sufficient this time to save, amongst other things, a fine crop of tomatoes intended to be exhibited a few days later at the Maryborough show. I first started sprinkling two rows with water. At first it acted well, the water instantly dissolving the white frost on the leaves. But the cold was so intense that the water very soon got frozen in its turn, the leaves becoming black and quite rigid. I then left the water alone, but put some quicklime into a thinly-woven bag and started dusting every plant all over until all the rows looked like as if they had just come out of a flourmill. Not a single plant perished, and nothing could be more pleasant to me than to see the astonished look of the visitors to the farm when finding, after such a sharp frost, whole rows of beautifully luxuriant tomato plants loaded with magnificent fruit. They survived the whole winter, and at the moment of writing they are again covered with ripening fruits, whilst the young plants sown in the spring have not yet blossomed.

The remedy is decidedly excellent, handy, and cheap. Keep it ready on your farm, and resort to it for all garden crops, for your vineyard, and young trees, acres of which can be thus saved by a man walking along the rows and shaking his quicklime bag.

Let us, then, never forget that if we cannot entirely suppress the ill effects of a frost, we can at least considerably minimise them by forethought, energy, and quick action. No dallying in bed on a frosty morning! An hour's work before sunrise may be worth many pounds to a farmer, and, perhaps, millions to the whole colony. In the meantime, let us not be discouraged by the last calamity. Let us save what can be saved of fruit trees and vines, and having turned into hay the injured wheat, let us then prepare without delay the land for other crops which are likely to have the benefit of a good coming season; for in that lies the great advantage of Queensland over most other countries, that some sort of crops can be grown here all the year round. In most of the best agricultural countries of the world, if a crop has failed, which happens there at least as often as here, the farmer has to wait 12 months for another crop, whilst here, three or four months after the catastrophe, another crop is ready for harvesting.

To quote only one instance to the point: A few years ago a most destructive hailstorm completely annihilated the whole crop of a farmer well known to the writer of these lines. It was on the 20th of November. The farm was in tip-top order, and every crop well advanced and promising. In twenty minutes everything was destroyed. The vines and fruit trees were stripped of their leaves; the corn chopped down; the potatoes, melons, and pumpkins cut level with the ground; and some 8,000 or 10,000 heads of cabbages and cauliflowers were lying on the ground, chopped into small pieces. The farmer was a poor man, working a rented place. The destroyed crops represented the whole of his assets, and, in fact, the daily bread of his large family. After examining the

situation, he found only a very small silver lining to the very dark cloud surrounding him. Two inches of rain had followed the hailstorm. The question was, how to make use of that moisture.

All hands and the cook, as the saying goes, started to work at once. Some were trimming, pruning, and tying up vines; others ploughing; others sowing and planting; others, again, cutting off the injured cabbage heads, splitting crosswise the stems in four quarters, which gave each a small hard head. These were sold later on at 1d. a-piece—making, thus, 4d. per plant, or over £60 per acre—probably more than the whole cabbages would have fetched. After a week of hard work, the whole farm (over 30 acres) was replanted and in good order, and, if anything, my friend had a better crop of everything than most of his neighbours who had escaped the hailstorm.

Floods and droughts, hailstorms and frosts, ticks and fruit fly, and, what is often more destructive than all those pests combined, a dishonest dealer in produce—all these drawbacks of the farmer can, must, and will be overcome by persistent individual and collective efforts. We know that from the beginning of the world all these and many other destructive forces have been at work in vain. They can retard progress—they cannot stop it! Every year new discoveries of the laws of Nature, new inventions in mechanical arts and labour-saving appliances, increase our powers and our chances of success. But they are useless unless we are endowed with the moral qualities required to make use of them. The life of a farmer is a constant battle and struggle. In that lies its moral grandeur and ennobling effects. He has to combat all the destructive forces both of Nature and of the human race. He is in the true sense of the word a soldier, and like a soldier he must be endowed with a dogged determination to be victorious at any price, to never allow himself to be cast down by any reverse, for only at such conditions can he fulfil to the letter the Divine commandment—"Conquer the earth and subdue it."

REDUCING BONES.

Mr. A. N. PEARSON, Government Agricultural Chemist, Victoria, writes :—

Bones in country districts, where crushing mills are not available, may be reduced by means of caustic lye, quicklime, or freshly calcined wood ashes.

A simple plan is to pack the bones, layer by layer, with the calcined wood ashes, taken fresh from the fire, in a barrel, cover the whole with a thick layer of soil, and keep the mixture moistened for some months. Casks may be kept in constant use for this purpose on a farm, receiving every few days a fresh layer of bones and ashes, removing the layer of soil for the purpose, and freshly calcining any old ashes that may have accumulated.

A quicker method is to boil the bones in an iron or copper boiler with strong caustic lye. The proportions of bones and lye are not invariable, but may be taken as about 10 lb. caustic soda or 14 lb. caustic potash, dissolved in 3 gallons of water, to 30 lb. or 40 lb. of bones. The bones boiled for two or three hours in this lye should be completely disintegrated. Even without boiling, the lye will, in a week or so, disintegrate the bones.

Another method of softening bones is to mix them in heaps with quicklime and loam. A layer of bones 6 inches deep is made, and on this is placed a layer 3 inches thick of quicklime, and then a layer 4 inches deep of loam. The layers of bones, lime, and loam are repeated until the heap is of a convenient height, when it is finally covered with a thick layer of earth. Holes are then bored into the heap from the top, and water poured in to slake the lime. The mass becomes hot, and will remain so for two or three months, after which the bones should be very friable. The whole heap may then be mixed up, and used on the ground at the rate of 10 cwt. or 15 cwt. to the acre.

BUILDING STACKS.

In December, 1898, we drew attention in the *Journal* to the necessity for properly stacking wheat to preserve the stack from mildew by dampness from the ground, and to prevent the rotting of the upper portion by the entrance of rain water owing to imperfect thatching or to no thatching at all. Here is a lesson which we cull from the *Farmer and Stock Breeder* :—

Several little matters in connection with the stackyard are often overlooked when once harvest is finished, and work presses in other directions. In themselves, and taken separately, they are often of no great apparent importance, but, nevertheless, likely to cause considerable damage if left unattended to, and which may generally be prevented with very little trouble. For instance, stacks may have been thatched almost as soon as put up, and the roof afterwards sunk, so as to form hollows in places. Such hollows do not readily allow the thatch to convey the water off the roof, but cause it to collect and soak through to the corn, and in a heavy or continuous downpour the damage is likely to be extensive and far-reaching into the body of the stack. The pitch-hole, particularly when loose corn is stacked, is very liable to sink in this manner. But wherever it happens, prompt steps should be taken to remedy the possible source of evil. This may be done by removing the thatch where necessary, and packing up the hollow, and afterwards re-thatching, or, better still, by placing another coating over the old thatch, so that no hollow is left.

Also the stack, although perfectly upright when built and thatched, may afterwards go over to one side and cause the water from the roof to run down the wall. This will naturally be the case the opposite side to which the stack is leaning, and cause the butt ends of the sheaves there to be higher than the corn ends, so that the water falling on them is conveyed inside the stack, where it must cause an enormous amount of harm. If the eaves cannot be made to project wide enough to shoot the water clear, a false eave should be fixed to the wall at the necessary height, so that this is accomplished.

In some instances rough thatching is done in harvest time, just to cover the stack for the time being, and better work intended at a more convenient time, but delayed too long or overlooked. After all the trouble of growing the corn and harvesting it, it certainly seems a great pity considerable damage should be allowed to happen when easily preventible. Weak eaves are often another source of harm, and generally result where a single stetch is used in that position; they often allow the water to trickle through them and down the walls. A firm eave given by a properly placed double stetch will shoot the water clear of the walls.

In a badly placed stackyard water often escapes very slowly, and after a heavy rain accumulates, and, finding no outlet, gets under the stacks and is sucked up, causing some considerable portion of both straw and corn to be spoilt near the bottom. This danger is further increased by heaps of rubbish or parings being left lying about against the stacks, as they help to block up the water. When harvest is finished it is always a good plan to clean up the stackyard and see that outlets are provided by which its water may escape.

HISTORY OF THE ANGORA GOAT.

THE Angora goat is a native of Asia Minor, and up to 1880 it was possible to purchase them in that country, but the Turks and Armenians became envious of the great advancement made in South Africa, and prevailed upon the Sultan to prohibit the exportation of any more goats. We are indebted to the enterprise of a few progressive Americans for those that were brought into the United States, and although the entire number aggregates less than 100 head, they have been sufficient to demonstrate the entire feasibility of breeding them in all sections of our country, and it is believed by many that our climate is capable of producing a class of mohair superior to either Turkey or South Africa. The

first lot of goats imported numbered about 30 head, and were presented to the Hon. J. B. Davis, American Minister to Turkey, in 1847, by the Sultan himself. They were doubtless of the best and purest blood that could be obtained, and soon after their arrival in this country Mr. Davis disposed of them to his friend, Col. Richard Peters, of Atlanta, Ga., who bred them with great care up to the time of his death, which occurred in 1891 or 1892. The progeny of this lot of goats has been scattered over the whole country, and was the initial step of the foundation of our mohair industry. The present available supply of mohair from all sources may be placed at between 18,000,000 and 20,000,000 lb., only 500,000 lb. of which is produced in this country, the remainder being divided about equally between Turkey and South Africa. It has been fully demonstrated that the Angora goat will thrive in all sections of the United States, but will perhaps do better in high and dry districts than in low lands. They are a great advantage in keeping down undergrowth in pastures and have been purchased for this purpose in many cases by parties in Iowa. A common herd of goats can very easily be improved by the introduction of Angora blood, and it is very difficult to distinguish the fourth cross from pure-blooded goats. The value of these goats consists mainly in the length and lustre of the hair they produce, but this is not attained in improving a common flock until the fourth crossing; which makes it very expensive to undertake, and may account to a large extent for the slow progress that has been made by Americans in building up the industry. The bucking season begins about July, but this is not a good time, as the young kids come during the winter, and unless they are sheltered, and the mother furnished with proper food, they will die. The period of gestation is five months and a few days, and it is advisable to separate the males from females about the 15th of June, until such time as will be proper to bring the kid after vegetation has started in the spring. The Angora rarely produces more than one kid at a time. The male is capable of producing at the age of six months, and the female will begin breeding about the age of one year, though it is advisable to keep her from it until the following season, if it can be done without great trouble. Shearing must be done as soon in the spring as the hair commences to shed. If left longer, the oil in the hair goes into the body of the animal and the hair loses its life, weight, and lustre. If the weather is cold, proper shelter should be afforded the animals for a short time after being shorn.

The hair should be packed according to quality, length of staple being the best guide as to grade. If the flock is of uniform grade, the hair may be packed in a sack loose, but if there are two or more lengths of staple it is advisable to tie each fleece separately so as to assist in a proper classification when sent to market. The writer was first attracted to the Angora goat as being a most excellent substitute for the wild fur-bearing animals so rapidly becoming extinct. The buffalo, which has supplied buggy and carriage robes for so many centuries, has been exterminated, and nearly all other kinds of fur are very rare and expensive. The demand for this class of product has always been enormous, and a glance over any fur dealer's price list will convince anyone that the fur industry is one of great promise. There is no domestic animal that can supply this great demand of the human family better than the Angora goat, inasmuch as the skin can be taken in such a variety of stages. For instance, when the hair is of one month's growth it can hardly be distinguished from the Astrachan, if dyed black; or it can be taken at an earlier period of growth and be made to represent the Polar or Black bear, according to the character of dye used. It may not be known that nearly all the buggy robes that are now sold as wild animal fur are nothing more than goat skins dyed. And perhaps young ladies who admire the so-called "real monkey skin" muffs and cloaks will be surprised to learn that they are only straight-haired goat skins dyed black. One of the most profitable uses that the Angora goat skin is put to is in making lace trimmings, which commands a price per yard equivalent to 15 dollars for a single hide. Another use is in making floor rugs and coverings for the backs of sofas and

armchairs. The beautiful lustre of the curly hair is brought out in a most effective manner by the reflection of gas light, and nearly all housekeepers who have not already some of these rugs, &c., are anxious to possess some. The supply of this class of rugs is limited, and the price, until recently, was very high—10 dollars and 12 dollars being often paid for choice skins. The present market value of Angora goat skins in a raw state is about 2 dollars each for well-haired skins, and were it not for the enormous importation of foreign skins, particularly Chinese, which are brought here by the thousands of bales, owing to there being no import duty on them, the price for our home product would be much higher. It may be well perhaps to state that the Chinese goat skin does not compare in fineness with the Angora, yet they are used extensively for cheap buggy robes and rugs, which naturally depreciates the selling value of the better article. The Angora goat-raisers intend to ask protection from such unfair competition, at the hands of our next Congress, and it is not unlikely that their demands will be granted. If the Chinese are not permitted to become citizens of this country, it is an outrage that we should be compelled to compete with their cheap labour at home. With a reasonable tariff to keep out the flood of foreign skins, there is no industry that can be made more profitable than the raising of goats for their skins alone. The meat of the Angora is of a very delicious character, although there is still a lurking prejudice in the minds of some on account of the strong flavour in the flesh of the common goat. This prejudice is rapidly being removed, however, and it will not be many years before Angora goat meat will be as much in demand as the choicest mutton is to-day.

Goats are among the most profitable stock on a farm. Those who go into the goat business extensively always find it profitable, but a small flock on every farm that has brush is nearly all profit. There is no animal that converts the weeds and brush into ready money like the Angora goat. They will eat almost every kind of weed that grows, even the jimpson. They seem to be a blight to brush; they eat the leaves, and the parent stocks soon die off. If they do not clean-cut your fence corners it is because they do not have a chance. Their wool is more valuable than sheep's wool, and one goat will eat more brush than five sheep. We are glad to be able at last to report a decided and legitimate improvement in mohair, with an excellent demand at advancing prices and the prospects of a steady, active trade during next fall and winter. Values in Europe have rapidly risen to the highest point known in years, with only small stocks available until the next Turkish clip. In view of the situation we feel safe in quoting for average domestic combed mohair 30 to 33 cents; good average, 35 cents; superior, 38 to 40 cents; and really choice selected, 42 cents or more. We advise all Angora goat-breeders to use only pure-bred bucks and only the very best. Our best consignors, those who are making the most money out of the goat business, are the men who have expended the most money for pure-bred bucks and have been the most careful in breeding long, lustrous fleeces. At present prices there is a fortune for the man who can raise fine mohair, and only disappointment and failure for the man who raises kemp. Shippers and mohair growers generally should shear only such of their flock as will yield a fleece of 6 inches staple or upwards, and thereafter, when it is practicable, let it grow to a full year's length if they want a full-grown price. A number of breeders pretend to have pure-bred goats, but in the face of the fact that there have never been more than 100 goats imported into the United States, and these were brought in from twenty to fifty years ago, is it a great stretch of imagination to suppose they have not been kept pure? We are of the opinion that there are no goats in the United States to-day that can be called pure-bred with anything like absolute certainty. A very high regard is always manifested for pure-bred stock, and importation from abroad has invariably proved to be an excellent card for the breeder. We consider this a great error, and in defence of our opinion will point to the Spanish merino sheep, which has been so greatly improved by American breeding over the original stock that the American merino sheep is now preferred by breeders in all nations. The

same experience has been realised with the hog, shorthorn cattle, racehorses, and, indeed, nearly all kinds of stock that the Americans have undertaken to improve. We predict the same result with the Angora goat. Our first start in goats came from the Peters' flock in Georgia at 60 dollars per head, and we can show animals to-day far superior to those purchased from Mr. Peters. Our experience has been that any goat of good qualities will breed well, and if a beginner will select only animals that are well coated with hair he need not be afraid of results.—*Prairie Farmer*.

EXPERIMENTS IN MANURING.

THE Director of Agricultural Education to the Gloucestershire County Council, Mr. Howman, has carried out a series of interesting experiments in the manuring of fields. Plots of $\frac{1}{4}$ -acre each have been annually manured under five different systems. Basic slag was used alone and in combination with nitrate of soda. Bone meal was used with mineral superphosphate in a third case, while the two remaining plots were manured with kainit and gypsum. The quantities of each manure used are not given, but the following is the cost per acre:—For slag, 15s. 8d.; for slag and nitrate, 26s. 8d.; for bone meal and superphosphate, 16s. 8d.; for kainit, 7s.; and for gypsum, 5s. 6d. The whole of the plots on two different fields were manured five years ago, and have not been manured since. In 1895 the plot receiving slag alone returned an increased value per acre of 2s. 4d.; in 1896 the field was grazed; in 1897 the increased value was 59s. 4d.; in 1898, 35s. 6d.; and in 1899, 51s. 8d.; or in all £7 8s. 10d. for four years. Where slack and nitrate were employed, the increased value as compared with slag alone was slightly more in 1895 and 1897, but less in 1898 and 1899; the total increased value for the four years being £6 4s. The bone meal and superphosphate gave a total increased value of 22s. 8d., the kainit of 2s., and the gypsum of £1 18s. 8d., so that the slag proved the most useful manure.—*Engineer*.

FROST PROTECTION.

THE devices for protection from frost used in Florida conform in character to those tested in the California experiments, in which coal fires were found to be the most effective means of protection, and appliances for adding moisture to the air were successful only to a degree. As artificial appliances are totally inadequate to add to the atmosphere any very appreciable amount of moisture, it is evident that methods which may have been found ineffective, in the dry climate of California would possess value in locations where their office is confined to adding moisture to an already moist atmosphere. The Gulf and South Atlantic Coast States, and in fact the country generally from the Mississippi Valley to the Atlantic seaboard, possesses a moist atmosphere, and the fruits and tender garden vegetables of these districts can, therefore, be the more readily protected from frost by devices which add moisture to the air. As a means of adding moisture to the air, irrigation should be more effective in California, and in localities where this method can be used protection would be assured, except against hard freezes.

Owing to the comparatively inexpensive character of the materials used in damp smudge fires, they seem the best adapted for common use in orchards, vineyards, and gardens. Berries and other low plants can be protected with but little expense by coverings of straw and other light materials. Devices for actually heating the free and open air, are expensive and of doubtful utility, and their value is dependent solely upon a comparatively still air, and small, numerous, and well distributed fires.

In Florida many experiments have been made with a view to adopting devices which will protect orange-trees from injury during the periods of severe cold which at times visit that section. The fact that these periods of cold are

infrequent does not relieve the grower from the necessity of providing for their occurrence. The most economic of the devices tested appears to be the "banking up" of trees with dirt or sand. In Florida as in Louisiana this has been found to be a very effective means of protection. The trunks of the older trees can be banked, and the younger trees can be almost entirely covered without necessarily causing any damage to the trees.

The more expensive methods include warming the air by means of open wood fires and sheet iron stoves. These methods have been found to be fairly satisfactory on still nights. Coverings of cloth and other suitable materials are stretched on frames, and the confined air is warmed by means of stoves. One extensive orange-grower is building board sheds over his groves, the interiors of which will be heated by wood fires. When danger from frosts and freezes is past, the tops and sides of the sheds can be removed. On account of their great cost, covering of this character cannot, of course, be generally used.—*Bulletin of the United States Agricultural Department, Florida.*

CROSSING ONIONS.

A MOST interesting experiment is being made in England at Kinver Nursery in crossing onions. The beautiful globular shape and delicate white quality of the New Masterpiece have for some time been well known, and it has won a great many prizes at shows. The experiment is that of crossing it with White Spanish. There is every prospect at present of the venture turning out highly successful, and of an entirely new onion being brought into existence which shall combine the good qualities of both parents. Kinver has, however, at least three other new onions, which are great favourites of gardeners, which have won many prizes, these being Ringleader, Improved Banbury, and Imperial.

Of course, by the continuous and persistent practice of cross-fertilisation, there must be a great many new creations of everything crossed. Easy enough is it for the practised expert to get them, but it is just then that his hard work commences, for the offspring is sure to be very varied, and he finds the majority worthless, and only one here and there worth propagating. Often, too, after taking pains with a likely candidate for fame for two or three seasons, he finds it fail. Cross-fertilisation is a lottery, in which the prizes are few, the blanks many.

UTILISING THE AMERICAN CORN CROP.

THE corn carnival is the feature of the great valleys of the Central West "when the frost is on the pumpkin and the corn is in the shock," but with a crop of some 300,000,000 bushels to harvest there are tired souls and wearied bodies in the corn belt these fine autumn days. The promise of wealth and abundance of this world's goods brings consolation and joy; it is the prolonged labour without the monetary compensation that disheartens and dispirits. Never was there a more propitious corn carnival season than the present, and Kansas and the corn belt are jubilant. Crops are good and prices are good. Corn is everywhere, and everything. One cannot walk the streets of a Kansas town to-day without encountering witnesses of the State's wealth. There are corn neckties in the show-windows; corn-husk parasols and hats in the possession of fair women pedestrians; cornstalk canes jauntily swung by prosperous swains; and corn shoes and dolls for children everywhere. The manifold value of corn for household and personal adornment has been the feature of each succeeding carnival, and this year's creations have totally eclipsed anything heretofore witnessed.

But while the carnival emphasises the ornamental side, there is an under-current of seriousness about this adaptation of corn and its by-products that more deeply concerns the people than an outsider might imagine. Corn was

never used in so many different ways for commercial and manufacturing purposes as in the past year or two. If we cannot induce the Europeans to take our corn for household uses, we can manufacture it into different articles of commercial value which they must take. This seems to be the trend of thought in the corn belt, and new inventions and discoveries annually open up new consumptive markets for corn and its products. Corn is gradually entering into industries that seem far removed, in every sense, from this product of the fields. The queer corn shoes, corn hats, dolls, and neckties which were made and exhibited for celebrating the corn carnival stand in sharp contrast with the corn oil, corn cakes, and corn rubber.

The one hundred and twenty odd recipes for using corn as an article of food, which Government experts published ten years ago for the benefit of benighted Europeans who did not appreciate this article of food, are not so important in increasing the consumptive demand as some of the recent discoveries. Corn oil, for instance, which is extracted from the grain, has an extensive demand in various trades where vegetable oils are essential. Corn oil can be produced more cheaply than most of our vegetable oils because of the relative abundance of corn, and in the last year much of the oil has been used for table purposes. No attempt has been made to substitute for good olive oil, but judiciously mixed it will pass muster as a low-grade table oil. It is also a fair lubricating oil; but its largest use is in the trades and manufactures. Paint mixers employ it quite generally, and also manufacturers of fibre and shade cloth. It possesses qualities that recommend it particularly to these industries, and the demand for it is annually increasing.

Corn rubber is a new article which is substituted for pure rubber in certain lines of goods. This cheap substitute is mixed with equal parts of pure Para rubber. The corn part of the substitute is taken from the refuse of the glucose factory. About 5 per cent. of the corn in making glucose could not formerly be utilised, and this waste seemed absolute. The new corn rubber is manufactured from this apparent waste, and when mixed with pure rubber it produces an especially valuable compound. Improvements in this rubber substitute are made each year, and it has to a certain extent supplanted Para rubber for many purposes. This imitation rubber is from 25 to 50 per cent. cheaper than pure rubber, but it has not been sufficiently perfected entirely to displace the Para article. The oil which is found in corn gives a pliability to the rubber compound that prevents it from cracking and breaking as most cheap grades of rubber do. Moreover, the oil of corn tends to prevent the rubber from oxidising—a fault common to most india-rubber.

There are five refineries of corn oil in the United States which use between 10,000,000 and 20,000,000 bushels of corn and corn waste. Besides the output of oil, the refineries have made nearly 30 other different products from the corn. But in spite of all these various products about 5 per cent. was practically waste until the discovery of the rubber substitute was made. The spirits distilled from corn constitute another large industry, and recently the employment of the spirits in the manufacture of new grades of smokeless powder has greatly increased the demand for corn. The British Government has been a liberal buyer of the spirits for this purpose, and the Japanese Government has quite recently placed an order for several thousand barrels for the same purpose. An extensive European war would consequently send the price of corn "booming," because of its general need for food, and because it would be in demand for the manufacture of large quantities of smokeless powder. The distilling companies are not only increasing in number, but the output of the largest is doubling. They absorb an enormous quantity of the farmer's corn, and prevent a surplus that might otherwise reduce prices below the point of profit for the growers.

The comparatively new cattle foods owe their existence to the employment of corn in various manufacturing purposes. All of them have received scientific tests and the endorsement of experts in cattle-feeding. The corn-oil cake, which is really the refuse of factories, contains nutriment of a high order, and

when properly fed, in conjunction with other foods, it is of great value to the animals and money in the pocket of the farmer. Gluten meal, gluten feed, and chop feed are other cattle foods that owe their origin to the different factories employed in converting corn into products of commercial and scientific use.

The manufacture of glucose has opened up a whole field of new industries, and the glucose made from corn enters quite extensively into the refining of syrups, jellies, and fruit preserves. It is also used by leather tanners and brewers. The sugar and starch made from corn form other branches of important industries. Different grades of grape sugar are made from the corn, and they are used by ale brewers and tanners, while the better grades are employed by apothecaries and confectioners. Pearl and powdered starch come from the corn, and also dextrin and flourin. The former is employed in the manufacture of mucilage and glue, and the latter is mixed with flour. The new uses to which these by-products of corn are put multiply rapidly, and every new employment of any of them makes a greater demand upon the corn crop. It is all along this line that improvements are being made which encourage the corn farmers and improve the future for them. If it were not for the several dozen different articles which are made from corn, the farmers of the corn belt would long since have been ruined. A crop of 300,000,000 bushels would simply swamp them, and make corn so cheap that it would not pay to harvest it. But with this enormous crop in view, the farmers are happy and jubilant, because there is sufficient demand for the product to keep the prices up.

THE SHEEP OF THE WORLD.

AMONG the numerous tables enshrined in the annual volume of the *Agricultural Returns* none are more interesting than those relating to the crops and live stock of foreign countries and British possessions. The data from which these are compiled are varied, and the information is necessarily incomplete, and in many cases by no means up to date, although, of course, it is brought down to the latest year for which it is available. As regards the number of sheep, the following figures showing the number possessed by each country in the latest year for which returns have been published are noteworthy:—

| | | | | | | | |
|-------------------|-----|-----|-------------|------------------|-----|-----|------------|
| Algeria | ... | ... | 7,435,000 | India, British | ... | ... | 16,875,000 |
| Argentina | ... | ... | 75,000,000 | Italy | ... | ... | 6,900,000 |
| Australasia | ... | ... | 103,000,000 | Norway | ... | ... | 1,417,000 |
| Austria | ... | ... | 3,187,000 | Poland | ... | ... | 3,755,000 |
| Belgium | ... | ... | 236,000 | Roumania | ... | ... | 5,002,000 |
| Bulgaria | ... | ... | 6,868,000 | Russia in Europe | ... | ... | 44,465,000 |
| Canada | ... | ... | 1,690,000 | Servia | ... | ... | 3,094,000 |
| Cape of Good Hope | ... | ... | 14,000,000 | Spain | ... | ... | 13,359,000 |
| Denmark | ... | ... | 1,246,000 | Sweden | ... | ... | 1,298,000 |
| France | ... | ... | 21,445,000 | Switzerland | ... | ... | 272,000 |
| Germany | ... | ... | 10,866,000 | U.S.A. | ... | ... | 37,657,000 |
| Holland | ... | ... | 700,000 | Uruguay | ... | ... | 16,397,000 |
| Hungary | ... | ... | 8,122,000 | | | | |

The great sheep-breeding countries of the world, therefore, so far as these figures show, are Australasia, Argentina, Russia, and the United States. All of these possess more sheep than the United Kingdom, which in 1898 had 31,102,000. But in proportion to area the United Kingdom enormously surpasses them, the four countries mentioned having, of course, immense territories. The figures, which are given in the *Agricultural Returns*, shows that the United States cover 2,292,000,000 acres; Australasia, 1,974,000,000 acres; Russia in Europe, 1,244,000,000 acres; and Argentine, 715,000,000 acres. The United Kingdom, on the other hand, covers only the comparatively insignificant area of 77,000,000 acres.—*Agricultural Gazette, London.*

QUEENSLAND AGRICULTURAL COLLEGE.

MONTHLY REPORT.

Farm.—During the past month the operations on the farm have been as follow :—Eleven acres have been ploughed for cow pea; 15 acres on bank of creek have been harrowed, rolled, and planted with five varieties of maize, including Celebrated Mastodon, Red Hogan, White Gown Silver, Knox Early, and Macleay River*; also, cut, stooked, and stacked 35 acres of wheat; cut, stooked, and commenced stacking 15 acres of barley—a very fine crop. The usual amount of work in cleaning crops and keeping down weeds has been carried on during the month. Our new grubber and spring harrow have been tried, with most satisfactory results. The teams have been kept busy during the month, the principal work being hauling timber from Gatton for new buildings (stewards' quarters and implement shed), gravel for approach to stables, and boiler and other equipment in connection with new pumping station at creek.

Garden and Orchard.—The following crops have been planted :—Melons of various sorts; beans, including Linia, wax, and kidney; marrows, squashes, and cucumbers.

In the orchard, all trees have been summer-pruned and sprayed, instruction being given to the students in these operations. The ground between the fruit trees has been cleared of old cabbage crops and thoroughly cleaned and cultivated.

In the grounds, the ordinary work of attending to the flower beds, mowing grass, &c., has been carried out.

Dairy.—During the past month the daily number of cows milked has averaged 68. The increase during that time has been 26 head—15 males and 11 females—comprising the following breeds :—2 Jerseys, 8 Devon-Holstein, 1 Ayrshire, 1 South Coast, and 14 grades. Nine male calves were destroyed and 1 male sold. 2,351 gallons of milk were treated, 859 gallons yielding 879 lb. of cheese, and 1,492 gallons giving 517 lb. of butter.

Pigs.—The increase of pure-bred stock was 15—7 boars and 8 gilts (Berkshires), while the general herd increased by 28.

The pigs have been fed on turnips (Swedes), small, inferior potatoes, and the by-products of the dairy.

The dairy herd was fed on the natural grasses only.

Mechanical.—During the past month the employees in this department have been engaged on the new implement shed and the stewards' quarters. The 1½-inch pipes from the well to the reservoir have been replaced by 2-inch pipes. The new boiler for pumping-station has arrived, and a start has been made in fitting it up.

Rainfall.—During month of October, 2·07 inches. In spite of this the ground is quite hard, and beginning to show signs of cracking. The early potato crops in the Gatton and Tenthill districts have suffered very much for want of sufficient rain, and are only likely to produce seed. Crops that survived the effects of the frost are now looking very bad. The early sown maize is beginning to suffer, and, unless we get an early rainfall, there is very little hope of a grain crop. Many fields are ploughed, and the farmers are awaiting rain before planting.

* In this crop an experiment is being made in connection with the spaces between the rows, these being at distances apart varying from 3 feet 9 inches to 4 feet 9 inches.

Precis of the Proceedings of the Marsupial Conference,

HELD IN BRISBANE ON 27TH SEPTEMBER, 1899.

Chairman: HON. J. V. CHATAWAY, M.L.A.

THE following delegates were present:—John Cameron, Pastoralists' Association; W. H. Calder, Adavale; E. W. Bowyer, Aramac; R. Dawes, Barcoo; W. Bacon, Belyando and Clermont; R. C. Lethbridge, Booringa; R. Speedy, Bulloo; Nugent W. Brown, Burnett; Arthur Bailey, Cloncurry and Gregory; R. Mackie, Condamine; W. H. Moore, M.L.A., Dawson; W. B. Taylor, Darling Downs; Stephen Egan, Gogango; Robert Gray, Hughenden; S. W. G. Macdonald, Leichhardt East; R. M. C. McLean, Leichhardt South; F. Cory, Mitchell West; W. A. Marks, Paroo; George Story, M.L.A., St. George; W. H. Trewecke, Waggamba; W. W. Hood, M.L.A., Warrego; and W. A. Cross, West Moreton.

The CHAIRMAN, in his opening address, said:—

You are aware that the Act to encourage the destruction of marsupials and dingoes expires at the end of the present year. There has been in the past considerable difference of opinion as to the working of this Act, and it was suggested by the Pastoralists' Association, represented by Mr. John Cameron, and Mr. W. W. Hood, M.L.A., that a Conference of those that were interested in Marsupial Boards should be called, as it was thought that by this means we could get the views, and in very many cases, conflicting views, of those living in very different sets of circumstances in different parts of the colony. The necessity for this was borne in on me by the fact that there are numerous applications for the alteration of the boundaries of the existing Marsupial Districts, and for parts of the country to be let off, as it were, from the operations of the Act. It is alleged, in many of the more settled districts, that the marsupials are now very scarce—if not absolutely extinct—and can be kept within reasonable bounds; and it seems to me a very good thing that the suggestion has had effect, and we have met together to consider as to whether the Act should be re-enacted, and if re-enacted, what alterations experience has shown would make it work more smoothly and more effectively. At the present time, in those districts which are grossly infested with marsupials, the funds at the command of the boards do not afford any means of paying for scalps for more than six or seven, or, at the most, eight months in the year, and during the period that scalping ceases, the marsupials increase. The work of the Marsupial Boards has been of very great value, as I think everybody will acknowledge. During last year the expenditure was £29,129 5s., and through this expenditure some million and a-half of marsupials were accounted for. The system of endowment which prevails in the Act now in force gives a considerable increase to the Boards over that of the Act of 1895, when the Boards received 10s. endowment for each £1 collected. The endowment during 1896-7 was £8,279 0s. 9d., and in 1897-8 £8,680 3s. 4d.; whereas under the present Act the amount already paid and due is £17,121 7s. 1d. Thus, under this Act, the endowment paid from the Treasury to the Boards is more than double.

There are various minor matters which were constantly coming before the Minister which seemed to require settlement. One is whether dingo scalps should be paid for, and, if so, whether they should be paid for at an even rate throughout the colony. There is another question that has been brought under my notice. It is whether those holdings that are fenced with marsupial netting should be chargeable with Marsupial Board taxes.

Each of you have an agenda-paper in front of you, which has been made out with a view of settling most questions that have been brought before the Department.

First of all is the question of whether the Marsupial Boards Act should be re-enacted, and, if you are unanimous on that point, I would ask you to consider whether the Act may be made a permanent one, or a temporary one, as at the present time.

If any delegate has any suggestion to make other than those on the agenda-paper before the Conference, and wishes to go into any question, I shall be glad to hear him.

After discussion, the following resolutions were passed :—

RE-ENACTMENT OF ACT.—Moved by Mr. Bacon (Belyando and Clermont), seconded by Mr. Egan (Gogango),—That it is necessary to re-enact the Act, with certain amendments. Carried.

Clause 1.—Agreed to.

Clause 2.—Moved by Mr. Calder (Adavale), seconded by Mr. Moore (Dawson),—That the term “scalp” be omitted, allowing the Boards to make their own definitions. Carried.

Clauses 3 to 9.—Agreed to.

Clause 10.—Moved by Mr. Lethbridge (Booringa), seconded by Mr. Cory (Mitchell West),—That the clause be so amended as to provide for voting being conducted by post. Postage free. Carried.

Clauses 11 to 18.—Agreed to.

Clause 19.—Moved by Mr. Moore (Dawson), seconded by Mr. Lethbridge (Booringa),—That the following words be inserted after the word “Board” on 1st line of subsection 1, “which shall be held within one month.” Carried.

Moved by Mr. Cameron (Pastoralists' Representative), seconded by Mr. Gray (Hughenden),—That the following words be inserted after the word “Chairman” on 3rd line of subsection 1, “and shall have the power to vote him a reasonable sum by way of remuneration.” Carried.

Clauses 20 to 24.—Agreed to.

Clause 25.—Moved by Mr. Calder (Adavale), seconded by Mr. Taylor (Darling Downs),—That this clause be amended as follows:—After the word “assessment” on the 3rd line, omit the following, “not exceeding two shillings and sixpence on every twenty head of cattle, and two shillings and sixpence on every one hundred sheep.” Carried.

Moved by Mr. Lethbridge (Booringa), seconded by Mr. Gray (Hughenden),—That in the event of any holding being unstocked or insufficiently stocked, assessment shall be paid by the owner in the proportion of ten head of cattle or fifty sheep for every square mile of such holding. Carried.

Clause 26.—Agreed to.

Clause 27.—Moved by Mr. Dawes (Barcoo), seconded by Mr. Bacon (Belyando and Clermont),—That Clause 27 be omitted. Carried.

Clause 28.—This clause is to be left out, as provision will be made for the compulsory payment for scalps and the levy of such assessment as may be necessary to meet the expenditure thereof.

Clauses 29 and 30.—Agreed to.

Clause 31.—Moved by Mr. Cameron (Pastoralists' Representative), seconded by Mr. Calder (Adavale),—That provision be made for the payment of assessment where the stock or the holding has been sold subsequent to the issue of the stock returns. Carried.

Clauses 32 and 33.—Agreed to.

Clause 34: Endowment.—Certain suggestions as to increased endowment were made. The Chairman promised to place the matter before the Cabinet.

Clauses 35 to 37.—Agreed to.

Clause 38.—Moved by Mr. Bowyer (Aramac), seconded by Mr. Brown (Burnett),—That this clause be amended as follows:—After the word “delivered” on the 2nd line, omit the following “to the Clerk of.” Carried.

Clauses 39 and 40.—Agreed to.

Clause 41.—Moved by Mr. Gray (Hughenden),—That the destruction of dingoes be made compulsory upon all boards, and that the bonus for same be five shillings. Carried.

Clause 42.—It was agreed that the rate of bonus for all marsupials should be fourpence per scalp.

Clauses 43 to 47.—Agreed to.

Clause 48.—Moved by Mr. Moore (Dawson),—That the Act be allowed to remain in force for a period of three years. Carried.

Dairying.

CREAM CHEESE.

THE following recipe is taken from the *Agricultural Gazette* (London):—

Take one gallon of sweet cream in a glazed earthenware vessel, heat to a temperature of 68 degrees to 70 degrees. If taken from a separator allow cream to stand from four to six hours to ripen. Add 15 to 20 drops of Hansen's rennet diluted with a little water; stir this in for 10 minutes, afterwards covering the vessel, and allow it to stand for 24 hours undisturbed in a temperature of 60 degrees; after this time it should be coagulated about the consistency of Devonshire clotted cream, and should be turned into a cloth and hung inside a vessel to drain in a circulating atmosphere of about 60 degrees. The cloth should be of coarse huckaback towelling, as it is thick enough to retain the cream and at the same time allow the whey to drain. The draining should continue for 18 to 20 hours, and during this time the cream should be scraped two or three times from sides of cloth to facilitate the separation of moisture. After this it should be turned into a fresh cloth and placed under weights of from 8 lb. to 12 lb. until dry enough for moulding, which generally takes from 8 to 10 hours. Before moulding, salt should be added at the rate of $1\frac{1}{2}$ oz. to 2 oz. to the quantity.

On the same subject a lady writes to the *Cape Agricultural Journal*—

When in England I was for several years in the habit of making these cheeses three and four times a week.

This was not done at a public dairy, but was carried out on a fairly large scale on a farm then occupied by my husband.

I had several small wooden vats, about 6 inches long, 4 inches broad, and about $2\frac{1}{2}$ inches deep. Small holes were bored in the bottom of the vats to allow the moisture to escape.

In the bottom of the vats was placed a strainer which had previously been wrung out in hot water—as hot as possible. After adding a small quantity of salt the cream was placed on that strainer, and another strainer (similarly prepared) was put on the top, laying it on the cream.

These strainers were changed night and morning, the fresh ones having of course undergone the scalding process, and this practice was continued until the cheese had arrived at the proper consistency. The time would necessarily vary according to the weather, but I usually looked for results after about three or four days.

The suggestions given in the *Journal* as to the addition to the cream of new milk, sugar, and rennet evidently refer only to the making of what is termed a new milk cheese, but that is a wonderfully different article from a pure cream cheese, which is indeed a great delicacy, and one which, in a climate such as that of South Africa, ought to be able to command very remunerative prices.

PIGS AND THEIR MANAGEMENT.—No. 1.

ALL who are interested in the pig industry should carefully read a paper prepared by Mr. W. R. Robinson, of Toowoomba, for the Agricultural and Pastoral Conference held at Mackay during the last week of June, 1899. Mr. Robinson is one of the highest authorities, if not the highest, on this important subject in the colony, and farmers cannot do better than follow the excellent advice given in his lectures and papers and in his little book on "Pigs and their Management," published in 1896.

The following is the substance of one of his lectures, read at the Mackay Conference:—"The industry is making rapid strides; it has come to stay, and by careful management it promises to be one of the largest and most profitable industries in this the garden of Australia. It has not been bounty fed, neither has it asked support from the Government. Throughout the colonies the public are daily learning to consume more pork products, and why? Simply because they are getting them put before them in a better form and more tastily got up. In America the consumption of pork products is something enormous, to say nothing of their export trade; that in the year 1883 exceeded all others (excepting wheat and cotton), amounting to £21,000,000. Now, if America can do this enormous business, surely we Australians should be able to capture some portion of so profitable a trade. We have our chilling establishments, fast lines of ocean-going steamers carrying cargoes of frozen products, and markets within easy reach of our shores. The Cape should be a fairly remunerative market.

"I notice that a shipment of cattle from our ports realised £32 per head. There should be room for a few shipments of pork there. Shipments of hams and bacon are regularly being made to West Australia, Tasmania, Batavia, and all our Northern ports. These are not pork-producing areas, and not likely to be, as the climatic conditions are not suitable; therefore there is every prospect of the industry forging ahead. There is also room, even in our town (Toowoomba), for a fresh pork and small-goods trade. The demand is good for well-got-up marketable goods. There is no place here where one can buy a decent joint of pork, pork sausages, pork pies, and other porcine dainties. These things only require putting before the people in an appetising form, and there would be no scarcity of customers. Owing to there being no fresh pork trade here, porkers are not a profitable class of pig for our farmers, as they must either sell them as forward stores to their neighbours or keep them until fit for the bacon-curer. This may not always be convenient when feed is short.

"THE PRICE.—This is the all important point to the farmer and pig-raiser. Well, pigs are like any other marketable commodity—they must fluctuate in value according to supply and demand. During the past 12 months farmers have been receiving a top price for their pigs, and in many cases, owing to their being fed on soft food, there has been a great shrinkage in the cured products, consequently loss of weight and loss to the bacon-curer. Grain-fed pigs are always worth more than milk and slop fed pigs, and if the past season had given a good maize crop, pigs would have been considerably cheaper, but at the same time would have paid the farmer as well. Take America. With their enormous grain crops, they get on an average 27s. 6d. to 30s. for prime baconers, which means a pig not less than 180 to 200 lb., whereas here we have been getting 34s. and up to 45s. for pigs only 120 to 150 lb., clearly showing that the American farmer prefers selling his cheap grain products in the form of live pork, and being a pretty wideawake gentleman, knows which pay him best. Now, with our favourable climate, cheap lands, and everything in our favour, we should, in the near future, be formidable competitors. At present the Sydney market may be said to control the Australian markets, as most of the southern colonies buy largely there, and Sydney buys largely there, both in a live and cured form. I have been trying to induce southern farmers to operate here, but lately there has been no profit to them, our prices being equal, and in some cases better than theirs. May, June, and July generally show a fall in prices, owing to the rush of fat pigs, in consequence of maize and pumpkin crops being harvested.

"**MARKETING.**—The present system of selling pigs will, I think, very soon be put on a better footing. The old idea of selling to any pigbuyer who chooses to go round to the styes and make an offer is by no means a good one; they must make their prices average right, consequently one man gets the value of his pig and the other man much less. You don't see woolgrowers selling their produce in this fashion; they submit their produce to public competition, and get market value for them. I maintain that all fat pigs should be sold by auction, and by live weight, not by appearances. I hope ere long to see this system in vogue; a weighbridge at the various markets could easily be erected, and let every lot of pigs be weighed, their weight posted above their pens, and sold at per lb. live weight; buyers would then know exactly what they were buying, and the farmers would be more satisfied, the well-grain-fed animal would give his owner a good idea whether it would pay him to grain feed or not. This matter of weighing might well be taken in hand by the Government; let them erect weighbridges at the various trucking yards where pig sales are held, and charge a small fee of, say, 1d. per head as a yard due. It would pay them well to consider this matter, as the business would be a remunerative one. I would also suggest that a qualified inspector attend all sales, and condemn any animal he considered unfit for food.

"A pig-breeders' association would be of great value to farmers and others, as there are many little matters that often crop up that require seeing into. Take, for instance, the trucking conveniences at the various railway trucking yards; they are utterly unsuitable to load a truck of pigs with; the present place and conveniences are enough to kill a man, say nothing about the bruising and injuries the unfortunate pigs receive. The shelter and watering conveniences are about as bad as they can be. An association might do a lot to remedy these existing evils, and materially assist in building up one of the leading industries in South Queensland."

Seeing how important this industry already is, and of what great expansion it is capable, we propose to publish a series of articles, collated from as varied sources as possible, on everything connected with pig-breeding, in the hope that a few grains of wheat may be found amongst the chaff, which will have the effect of improving our breeds, improving the treatment of pigs, decreasing their ailments, and improving the methods of curing bacon and hams on the farm. And first we will consider

THE MOST PROFITABLE PIG.

It is needless to say that authorities are not all agreed upon this point. Breeders have their preferences, but the crucial tests are the market and the bacon factory. *Hoard's Dairyman* says:—

The most profitable pig to breed this year and hereafter is, without question, the Tamworth. The Tamworth is the pig *par excellence* for the packer and feeder. Its length and depth of body are so pronounced that no breed of pig can approach it in these important respects. Its shoulder is light but deep through the chest and wide between the forward legs, giving it the indispensable lightness of shoulder with large heart girth and great vitality. The Tamworth is wide behind, with strong back, and great depth through the flank, and hams well let down; and these are points sought by the curer.

It is well to be cautious in trying new breeds of pigs, as well as anything else, and to "prove all things, and hold fast to that which is good"; but if this idea were carried to an extreme, people would still be breeding the scrub. More, the unexampled docility of the Tamworth can be approached by no other breed. The Tamworth is more prepotent, has the functions of motherhood more pronounced, and has greater precocity than any breeds of pigs yet brought into public favour.

The following is the standard of excellence for Tamworths adopted by the National Pig-breeders' Association of Great Britain, and formulated with a view to the production of the highest quality of bacon:—

Colour—Golden-red hair in a flesh-coloured skin, free from black.

Head—Fairly long, snout moderately long and quite straight, face slightly dished, wide between ears.

Ears—Rather large, with fine fringe, carried rigid and inclined slightly forward.

Neck—Fairly long and muscular, especially in boar.

Chest—Wide and deep.

Shoulders—Fine, slanting, and well set.

Legs—Strong and shapely, with plenty of bone, and set well outside of body.

Pasterns—Strong and sloping.

Feet—Strong and fair size.

Back—Long and straight.

Loin—Strong and broad.

Tail—Set on high and well tasselled.

Sides—Long and deep.

Ribs—Well-sprung and extending well up to flank.

Belly—Deep, with straight underline.

Flank—Full and well let down.

Quarters—Long, wide, and straight from hip to tail.

Hams—Broad and full, well let down to hocks.

Coat—Abundant, long, straight, and fine.

Action—Firm and free, spirited.

Objections—Black hair, very light or ginger hair, curly coat, coarse mane, black spots on skin, slouch or drooping ears, short or turned-up snout, heavy shoulders, blocky build, small heart girth, elephantness, wrinkled skin, inbent knees, hollowness at back of shoulder.

The Tamworth bred in conformity to the standard, shows angularity of conformation rather than blockiness, and the fundamental characteristics of the Tamworth are in many ways similar to those of the dairy cow. The law of milk-giving, red-meat elaboration, and maternity is precisely the same in the bacon pig as in the bovine dairy mother. The Tamworth bacon pig shows a prominent backbone and well-developed vertebrae—the indication of large spinal marrow and great nerve force.

The Tamworth bred in the standard has a slightly prominent pelvic arch, showing her strong maternal power; and the milk-giving function is shown by her udder, of long abdominal attachment from front to rear, and well-balanced as to form, coupled with strong, wedge-shaped digestive capacity, and her constitutional vigour is not only shown by her large heart girth, but, by the strong navel development.

The well-bred Tamworth is a brainy animal. This is shown by her long, lean, and smallish head, and her bright, prominent, protruding eyes. By reason of her highly nervous organism she is as susceptible to kind or abusive treatment as is the gentle kittenish Jersey.

From the above it will be seen that the Tamworth is fundamentally a dairy breed of swine; and a successful dairyman should, from his association with high-bred dairy cows, make a good breeder of Tamworths and a successful producer of fine bacon. The feeding of the young bacon pigs is essentially the same as the feeding of dairy calves, and the bacon sow calls for essentially similar feeding to that of the dairy cow. The infusion of Tamworth blood into that of Berkshires would be a decided improvement.

Mr. Robinson favours the Improved Berkshire, so do Messrs. J. C. Hutton and Co., the well-known Brisbane bacon-curers. They say:—"Now that pig-raising is becoming an important part of farmers' work, it is desirable that they should have a clear idea of what class of meat is required by the manufacturer. In all parts of the world, and in this colony in particular, the demand is only for lean medium-sized bacon. By lean bacon, we mean that a large amount of lean, streaky meat must predominate. To get this, farmers must give more attention to their breed of pigs: the common, ill-bred swine, which give so much fat, must be dispensed with. As bacon-curers, we recommend the medium Berkshire pig, which, properly fed, will, at seven months old, produce the class

of bacon we desire. In order to enable farmers to secure this breed, we have established a stud at our farm at Zillmere, and growers desiring to improve their stock will kindly communicate with us, and we will be pleased to furnish all particulars as to price."

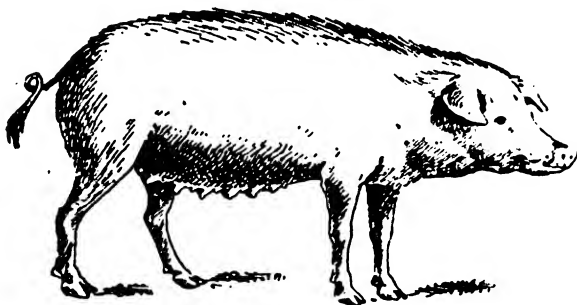
Mr. Thorne, a South Australian breeder, says:—"The best pig to keep, either for market or for home use, is the Berkshire; they make the best bacon and the nicest shaped fitch or middle. If you do not keep the pure breed, let them be very nearly pure. The sow might have a strain of some other breed, but not the boar. I consider that the farmers and pig-breeders of South Australia have profited more by the importation of the Berkshire pig than by any other animal. If you want a side of bacon a nice even thickness, and with the lean well mixed, or a nice-shaped ham with a small bone or middle, what pig can you get better than the Berkshire? The Poland-China pig is coarse in the flesh and very large in the bone. The Essex is small in the bone, but very fat, with a very little lean mixed in the bacon. The middles, which generally secure the highest price, are very uneven; they fall off so in the flank. In making good sweet bacon much depends on the age of the pig; they should not be more than eight or ten months old, and should weigh, when killed, from 160 lb. to 200 lb.

Here we have the opinion of a British breeder:—"In this country the pig that commands the highest price is an animal which, though well finished, must not be over fat, and which turns the scale dead weight at 12 stone. The live weight of this animal would be about 15½ stone to 16 stone. This type of pig is called a 'bacon' pig, and is that required for the London trade. 'Berwick' are small, plump pigs, averaging about 8 stone dead weight—that is, ranging between 7 stone and 8½ stone. The price for these is usually the same as for bacon pigs, but at certain times of the year, through scarcity, they may fetch 2s. to 3s. per cwt. more. They are used for the ham and middle trade, and the manufactured article is almost all sold in Ireland. Pigs of an intermediate class—that is, ranging between 8½ stone and 11 stone dead weight—are by no means so saleable and rarely command so big a figure as either bacon pigs or Berwicks. They are called in the trade "six-sides," and at certain times of the year, notably in spring, are greatly depressed in price, being often quoted at 4s. to 5s. under the other class. There is another type of pig—the 'over-weight.' The highest weight generally killed at the factories is 13 stone. There are, however, a few killed some pounds heavier than this, and there is always some 2s. or 3s. per cwt. less paid for them, as the class of bacon manufactured from them is inferior, and has to be sold for considerably less money in the English markets. All the above classes of pigs must be well fed, but not over-fed. A good bacon pig of 12 stone ought to be produced in seven months from its birth. It should not be crammed, neither should it be half-starved, but fed steadily and regularly. Pigs fed steadily and regularly will give the most satisfactory results to the feeder when weighed in the factories. A pig which has been half-starved at any period of its life, even though well fed afterwards, will not do so. The most profitable pig is the one that weighs 200 lb. at six months old. Two such lots can be produced in one year, and they will bring more money for the amount of feed consumed than one lot weighing 400 lb. at a year old."

The most profitable pig to feed is one which is deep in the heart and round in the ribs, as it will of necessity produce a larger quantity of first-class bacon—viz., prime back and ribs—than an animal that is light-chested and flat-sided. This is one of the most valuable parts of the animal, and it is therefore desirable to add as much as possible to its weight. Looking at the matter from a breeder's and pig-feeder's standpoint, the pig that is deep in the heart and round or well sprung in the ribs will certainly be a good feeder, because he has plenty of room for his stomach, liver, heart, and all the main organs. Roundness of rib nearly always indicates a good constitution; flatness of ribs the reverse. A pig well sprung in the ribs will carry considerably more meat on the bone, and have the ribs better clothed with flesh, than one of different conformation. The leading essentials in form of a bacon pig are—(1) good length and depth of

body without excessive width ; (2) limbs strong and of medium size ; and (3) head and ears and neck of medium size. That is not a bacon pig which has a very short, compact body, a frame broad in proportion to its length, and that stands on small and short legs. It is a lard pig. Nor is that a bacon pig which is razor-back and greyhound in its build. It is a scrub that would soon eat its owner poor. The bacon pig is not a hard feeder. It is a pig that will turn its food, not into an unhealthy substance that melts away in cooking, but it will turn it into a good meat.

Such a pig as is here illustrated is not "a thing of beauty and a joy for ever." As a comparison, it is neither so attractive as the gay gos-hawk nor so endearing as the gentle gazelle, but it is, nevertheless, useful. As a piece of furniture, it may lack the artistic belongings of Buhl work, or the æsthetic feeling of Chippendale's productions ; it has, nevertheless, its solid proportions ; and when killed and cured and displayed in hams and gammons in the fitful glow of the evening firelight of the farmer's spacious kitchen, there is something to be said, after all, for the solidifying comfort of the porker. In distant days, when man was free from the trammels of steam and electricity, and the confines of travel were only narrowed by the possibilities of what he could perform on shank's mare, unless he was affluent and possessed a four-legged one, pigs and poultry too were at liberty to indulge their nomadic tastes without the deterring influences of barbed-wire fences and other drawbacks. Swine then "lived in clover," so to speak ; they scoured the hills and the valleys in search of provender, and singly and in herds travelled in one day, so far as distance runs, more than they now cover in a month. But these were the times when the pig was not the valuable article of commerce that it now is. The animal had to look after itself, with the result that it possessed many of the characteristics belonging to its natural, or rather wild, state. It was not pampered and fed for weight, nor was it fed for points. A glance at the accompanying illustration



The Razor-back Pig.

will be instructive : "Look on the above picture"—the wiry and alert old-fashioned razor-back. The process of levelling up the pig as we now know it, from its frisky-looking progenitor, has occupied many years, but the labour has met with its reward. The animal, point for point, is far more valuable than it was, and the fecundity of the type suffered in the development of size and weight. Under existing circumstances the life of a pig cannot be a particularly enviable one, as animal life goes, for the depressing effect of having to carry about so much flesh, even at an early period in its career, must rid the days of much of their porcine gaiety. If the swine of mythology were over-fed and endowed with the fleshy proportions of their type of to-day, then the lot of the sportive companions of Ulysses must have been an unhappy one after the enchantress Circe had cast her spell upon them.

SWINE.

BACON-CURING FROM THE ENGLISH POINT OF VIEW.

THE following article on the above subject was written by Mr. Loudon M. Douglas in the *Agricultural Gazette* of New South Wales, and we are indebted to that journal for the illustrations which accompany the article:—

MODERN HAM AND BACON CURING.

The great strides made in the business of bacon-curing during recent years, and the constant developments that are taking place, render it necessary that from time to time the process of curing, as modified and brought up to date, should be described in some periodical accessible to everyone.

The process of curing is simple enough, consisting as it does for the most part of adding preserving substances to the meat and allowing time for such materials to saturate the tissues. This preserving process checks the development of bacteria and renders it possible to keep bacon, and other meats similarly treated, for an indefinite period.

For the purpose of slaughtering and preparing the animals for the cellars, the pigs are hoisted by means of a friction hoist driven from the main driving shaft of the factory, by one of the hind legs, to an overhead bar. The moment they reach this bar the slaughterman passes a sharp knife quickly into the neck through the jugular vein, and in the direction of the heart, but withdraws it instantly. The pigs bleed quickly and suffer very little pain. They are immediately pushed along the track bar to the bleeding passage, and are allowed to hang till all the blood has flowed from them. They are then flung on a dumping table, and the leg chains are removed. They are at once rolled into a scalding vat, nearly filled with water at 180 degrees Fahr. The carcasses are rolled in this vat until the hair and bristles come away easily in the hand. They are then hoisted by means of a "cradle" on to a scuttling table, where the remains of the hair and the bristles are removed by means of bell-shaped scrapers. They are next swung by an oblique board on to the track bar again; and are brought to the singeing furnace, in which they are singed for about a quarter of a minute, lowered again to the track bar, and plunged into a cold bath, from which they are immediately hoisted to the track bar again; and while sprays of cold water are playing upon the carcasses, the latter are scraped by means of flat hand-scrapers free from the burnt surface. The intestines and offal are then removed and sorted in various departments, and the carcasses, after again being cleansed, are split down the back, the vertebral column removed, and the two sides, including the vertebral column, the head, the feet, and the flick lard or kidney fat, are weighed. This is what is known as "dead weight," or the weight upon which payment is made (the dead weight of a hog weighing alive 16 stone would be 12 stone). From the dead weight it is the universal custom to deduct 2 lb. per side for beamage,* and the price then is the price of the net weight. After the weight is ascertained, the head and fore feet are completely severed, the kidney fat and vertebral column are removed, and the sides are disconnected and allowed to cool in the hanging-house for a period of from 6 to 12 hours, according to the time of the year. They are then placed in a chill-room for about 12 hours, until the meat registers, on a meat-testing thermometer, 40 degrees Fahr. This temperature is obtained by keeping the chill-rooms at 38 degrees Fahr. The bladebones are now removed, and the sides trimmed and taken to the cellars.

WILTSHIRE BACON.

On being taken to the cellars, the sides are laid on a bench and pumped at a uniform pressure of about 40 lb. per square inch, at the places indicated in Fig. 1, with a pickle made from the formula:—Salt, 50; granulated saltpetre, 5; dry antiseptic, 5 (cane sugar, in winter only, 5).

* "Beamage" is the deduction made in weighing pigs warm. The moisture which evaporates before the flesh becomes rigid is estimated at 2 lb. per side, or 4 lb. per pig all over. It is the universal custom for bacon-curers to deduct this amount.

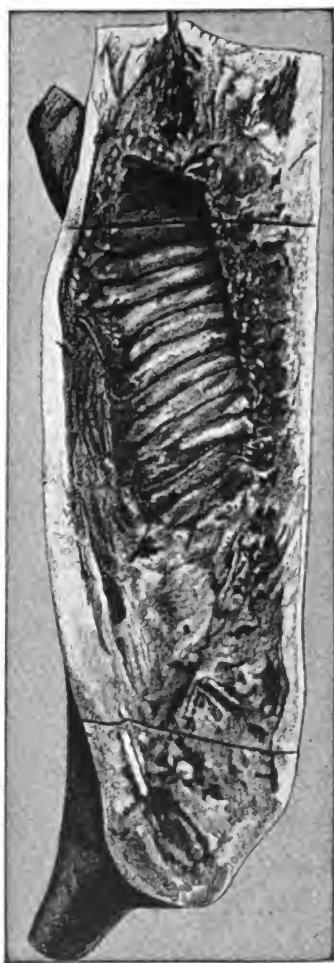
Plate OLIII.

Fig. 2.—Pale-dried Wiltshire Bacon.



Fig. 3.—Smoke-dried Wiltshire Bacon.

To this add 20 gallons of water and stir till all the material is dissolved. The strength as shown by the salinometer should be about 95 degrees. If such is not indicated, add salt and stir until it is.

A mixture of equal quantities of saltpetre and dry antiseptic having been previously prepared, the sides are first wiped with a portion of the pickle used for pumping, and are then laid on the cellar floor. Some of the mixture of dry antiseptic and saltpetre is next sprinkled over the whole of the inside or cut surfaces. The quantity is usually just sufficient to slightly cover the whole (a sieve being very useful for the purpose of distribution). Salt finely ground is now sprinkled all over the same surface, and the side is permitted to lie in that condition for seven or eight days, when it will be cured, and may then be washed and baled for transport, or the sides may be washed and dried as "pale-dried bacon," or they may be smoked and sold as smoked bacon. Where space in a cellar is of value, the bacon is "stacked" or "piled."

The most important part of the foregoing description is that referring to the pumping. The diagram (Fig. 1) is designed to show the various portions

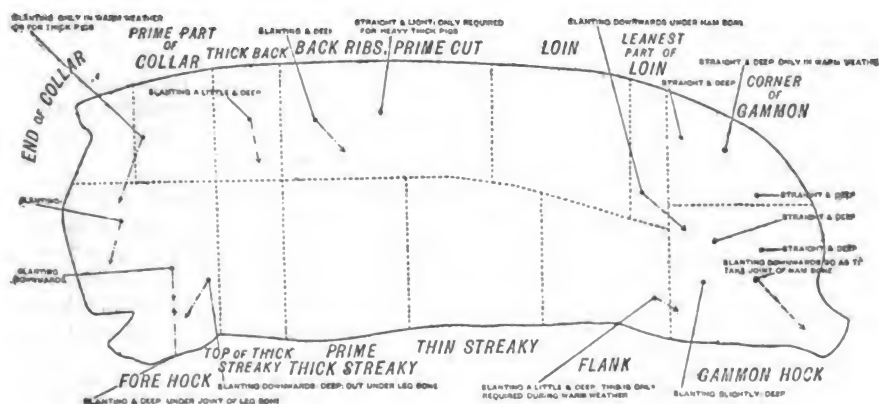


FIG. 1.

into which the side will ultimately be divided, and, at the same time, to indicate the precise place and direction in which the needle of the pickle-pump should be inserted. This diagram has been constructed with the assistance of those well skilled in the matter, and will doubtless serve a permanent purpose.

The process of producing "Wiltshire" bacon which has just been described applies practically to all other kinds. The names of different cuts are very many, and depend on the local habit of cutting portions of a side in a peculiar way. Perhaps the greatest rival of Wiltshire bacon is that produced in Cumberland; but the liking for Cumberland bacon is an acquired taste. It is highly charged with salt as a rule, owing to the primitive methods in use where it is produced. These old-fashioned ways will have to go, and give place to the modern methods; or, if not so, it is safe to say that Cumberland bacon will become a thing of the past.

When the bacon has been cured it is, as a rule, washed free from salt on the surface, and from slime, if any, and allowed to drain. If it should be wanted in the "green" state, it is simply sent out as it is in bales, wrapped in canvas. If wanted in the "pale-dried" state, (Fig. 2) the sides are hung up in a ventilated drying-room, heated to a temperature of 80 degrees Fahr. with steam pipes, and kept there until quite dry. "Smoked bacon" (Fig. 3) is produced by hanging the sides in a smoke store for about three days, where it is exposed to the smoke and fumes given off by smouldering hardwood sawdust. The ventilation of the smoke stores is a very important matter. When the sides are sufficiently smoked or dried, as the case may be, they are allowed to cool in the packing loft, after which they are weighed and baled for the market.

HAMS.

A somewhat different process is used in the curing of hams, although in principle it is the same. The hams are cut according to the particular description wanted after the sides have been chilled. They are then flung into a pickle tank, filled with pickle made according to the formula already given. They are allowed to remain there until next morning, when they are taken out and pressed so that the blood may be cleared out of the blood vein. The object of putting them into the pickle is to purge this blood away. They are next laid in beds of salt, care being taken to have the shanks pointing downwards. They may be pumped or not, according to the taste of the curer. The author's experience goes to show that it is wise to pump the blood vein with an antiseptic pickle at a low pressure. The same mixture of antiseptic and saltpetre is sprinkled over the cut surfaces, and the whole is covered with salt. At the end of three days the hams are taken up and pressed again so as to remove any blood that may have remained in the blood vein. They are then laid down and covered with fine salt, and are left in this position for about fifteen days. A very good rule applying to hams is that they require a day for every pound weight to cure.

MATURED BACON AND HAM.

The foregoing description of curing refers exclusively to meats meant for immediate consumption. The keeping of meat for a year or so requires a rather different treatment. The time in salt has to be extended for about a week in either case, and the hams or bacon require to be dried.

THE VARIOUS FORMS AND CUTS OF ENGLISH BACON AND HAMS.

The illustrations which form the essential part of this section are of a most suitable character, inasmuch as they are truthful photographic representations of the best English bacon and hams. I am indebted for the photographs from which these engravings are taken to Mr. John W. Welsh, of Redruth, who, in addition to being a competent bacon factory manager, is an adept with the camera.

It is only within late years that photographs of the interior of bacon factories have become available, owing to the close character of the business. Such secrecy is altogether a mistake, inasmuch as it only results in fewer factories being built and fewer pigs being produced. It is to the advantage of bacon-curers in England that there should be a large supply of pigs, and that farmers should know that their pigs will be purchased when they are grown.

To the best of the author's knowledge, the accompanying illustrations are the first of their kind published, and care has been taken that they should be correct and representative of the qualities of bacon and hams wanted in this country.

The average prices for the various cuts obtainable in England are shown subsequently on a diagram (Fig. 6). The author is indebted for these prices to Mr. Bartlett, of Smithfield Market, London.

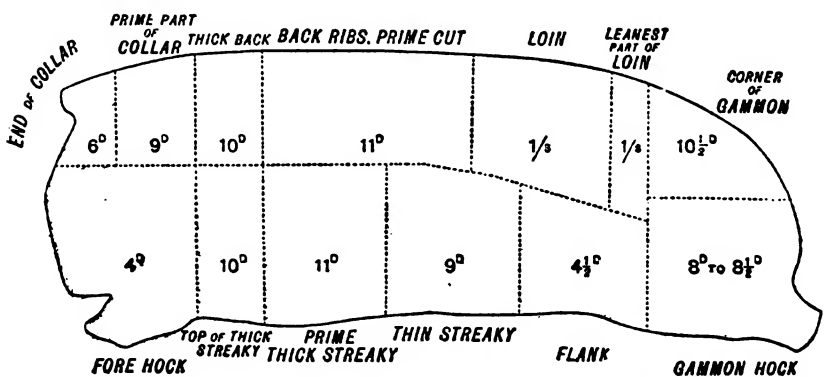


FIG. 6.—Diagram showing various cuts of a side of bacon, and average prices realised during 1897.

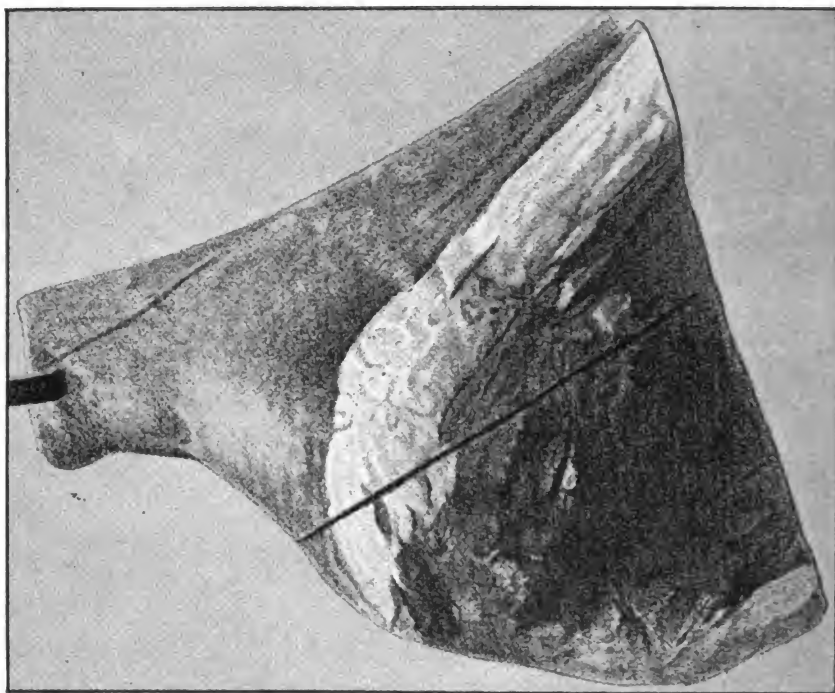
Plate OLIV.

Fig. 5.—Gammon of a Side of Bacon.

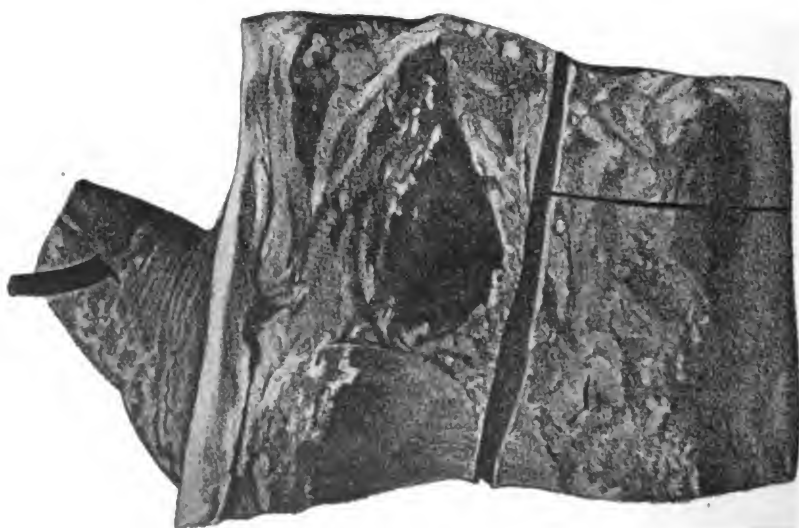


Fig. 4.—Fore-end of a Side of Bacon, showing Cuts for Prime Part of Collar, End of Collar, and Fore-hock.

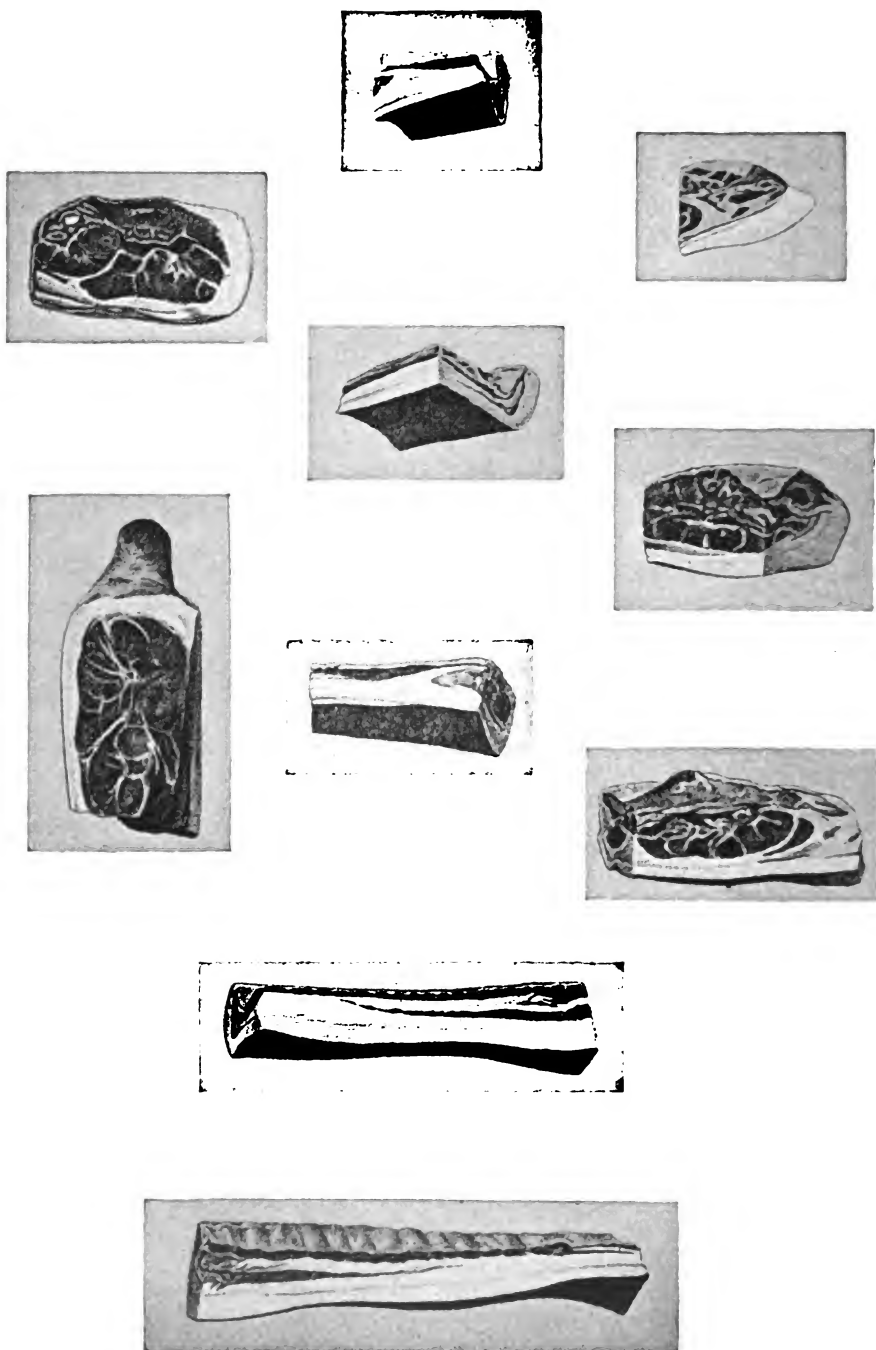
Plate CLV.

Fig. 7.—All the Principal Cuts from a Side of Bacon.

1. Corner of Gammon.
2. Three-quarter Gammon.
3. Flank.
4. Thin Streaky.

5. Long Loin.
6. Thick Streaky.
7. Back and Rib.
8. End of Collar.

9. Prime Part of Collar.
10. Fore-hook.

The sides of bacon illustrated in Figs. 2 and 3 embrace all the qualities of first-class produce. They are of good length, and show evidence of prime feeding. They are lean, and the fore ends are light and small. The middle—the most valuable part—is long and wide, with good streaky meat. The gammon is in proportion. It will be observed that the back outline is very straight from collar to gammon, and the fat of the back is of even thickness over the whole length. The sides carry a large proportion of lean down the back.

In commencing to cut a side of bacon, begin by cutting off the “fore-end,” as shown in Fig. 3. Cut between the third and fourth rib, and as straight as possible. The “pocket hole” should be left entirely on the fore-end, as indicated in Fig. 4. As the pocket hole is very liable to putrefy, the fore-ends should be disposed of at once. The fore-end can be cut into three or four different parts, three principal cuts being as shown in Fig. 4:—1. Prime part of collar. 2. End of collar. 3. Fore hock.

When cut as shown in the illustration, each piece will present a nice clean face to cut, owing to the ragged part of the pocket having been avoided.

The “gammon” (Fig. 5) should be cut off as shown by the irregular line in Fig. 3, the knife being passed at equal distance from socket-bone of gammon to end bone of loin. It will in this way retain its shape in cooking. The two principal cuts are as shown in Fig. 5:—1. Corner of gammon. 2. Three-quarter gammon.

The cut to produce these is made about 1 inch from the socket-bone on the hock side of the bone, the saw going easily through the thigh-bone; when cut the bone is seen only in a small ring on the face of each piece. These cuts show a quantity of solid lean nicely veined with fat, and in well-cured meat the appearance is always bright.

The “middle” is left after removing the fore-end and gammon, and it contains the most choice and, consequently, the most valuable part of the side. The principal cuts, as shown in Fig. 7, are five, viz.:—1. Thick streaky. 2. Thin streaky. 3. Back and ribs. 4. Loin. 5. Flank.

These cuts are all choice with the exception of the flank, which is an undesirable and unprofitable cut to handle. By the system of cutting shown, it is, however, reduced to the smallest possible dimensions.

The following prices—which may be read in conjunction with Figs. 6 and 7—have been sent to me by Messrs. John Sumner and Son, of Birmingham, and, as they are fairly representative of a good class trade, they are given here. These prices are taken from figures actually realised:—

| taken from figures actually realised : | | | | | <i>d.</i> | | £ | <i>s.</i> | <i>d.</i> |
|---|-----|-----|-----|----|-----------|---|-------|-----------|-----------|
| 12 lb. gammon | ... | .. | ... | at | 9 | = | 0 | 9 | 0 |
| 3 lb. flank | ... | ... | ... | " | 6 | = | 0 | 1 | 6 |
| 14 lb. shoulder and neck | ... | .. | ... | " | 6½ | = | 0 | 7 | 7 |
| 12 lb. streaky | ... | ... | ... | " | 10 | = | 0 | 10 | 0 |
| 16 lb. back | ... | ... | ... | " | 10 | = | 0 | 13 | 4 |
| | | | | | | | <hr/> | | |
| | | | | | | | £2 | 1 | 5 |
| Deduct 57 lb. side at cost of 59s. per cwt. | | | | | ... | | 1 | 10 | 0 |
| | | | | | | | <hr/> | | |
| Profit | | | | | ... | | 0 | 11 | 5 |

Hams are being produced in greater quantity in England now than for many years past. Pale-dried are equally in request with smoked. The disadvantage, however, to be contended with in making them lies in the difficulty of getting rid of the middles and fore-ends—the remaining part of the sides. In Ireland an enormous trade is carried on in exporting hams to France, and very high prices are realised there for them. The hams illustrated are distinctly English in character, but differ in cut from local kinds, such as those of Cumberland. The latter are large and very heavy, and are usually kept for about a year to “mature.” The English ham is meant for immediate consumption, and hence is cured very mild.

THE AYRSHIRE COW.

By JOHN STEWART, SENR.

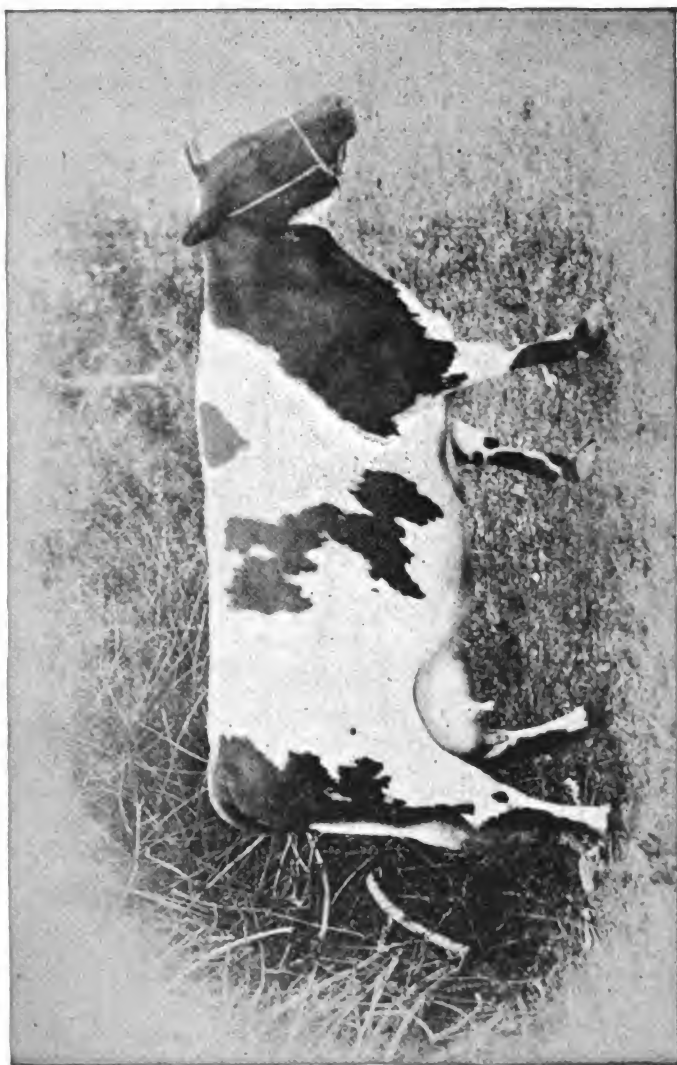
Ayrshire Dairy, Eagle Farm.

MUCH has been said and written on the origin, capability as a large milk-producer, points, and general treatment of the Ayrshire cow; and having been engaged in dairying, near Ayr, from my earliest years up to departure for this colony, sixteen years ago, I have been requested to pen a few lines on the above subject to your esteemed *Journal*.

The origin of the Ayrshire breed cannot be distinctly traced; some writers assert that they were produced by a cross of the Alderney with the native cattle of Scotland. Others, again, maintain that they were produced from the best milking strains of shorthorns, and also from the West Highland cow. I recollect reading a paper where it was stated that a Dutch vessel was once wrecked on the coast of Wigtonshire, and some of the cattle swam ashore, these being the nucleus of the present very extensive herds in that famous dairying country. The most successful breeder that I can remember was the late Mr. Parker, of Nether Broomlands, Irvine, whose cattle were rather small and deer-like, not possessing the depth and width essential for deep milkers; therefore, his success was principally with dry and young cattle, and he seldom gained prizes for their milking capabilities. In my opinion, they were bred from the Highland cows, their characteristics being beautiful head and horns, straight back, and fine barrel ribs. Some years later, when in the opinion of the best judges the breed was diminishing in size and being impaired in constitution, the late great ironmaster, Mr. Baird, who was then residing at Cambusdoon Castle, near Ayr, offered a handsome special prize for the largest Ayrshires. The breeders then resorted to the cross with the best milking strains of the shorthorns to produce size and width at the top or hook bones. The result was satisfactory only in altering the colour too much to the white, and now, for some years, prizes have been given for Ayrshires of a browner or red colour in preference, all the other points of course having due weight in the award. During the first half of this century, the breed were polled or crummy horned, that is, shorthorns turning inwards. Some 35 years ago I visited a farm near Dalry, New Galloway, and the cows there, which were called Ayrshires, were all polled, having evidently been bred from the Galloway cattle. It was found, however, that the Galloways were more suitable for beef-producing than for milking qualities, hence this class of cattle became almost extinct. Wigtonshire now is famous for its breed of Ayrshire cattle, which are exported all over the world, and as a great dairying centre it has no superior in Scotland. Many of the prizes offered for competition at the great show at Kilmarnock, open to Great Britain and Ireland, are won by Wigton dairymen, and some of the most successful dairy factories in the world are situated near Stranraer. I do not coincide with the opinion that the breed emanated from the Alderney or the Galloway cross. It is more probable that the happy medium was attained, first, from the Highland cow, and then, from the old milking shorthorn, and I have observed that the cattle having dark points have been the breed truest to type.

As a milk-producer, the Ayrshire cow stands pre-eminent, and this fact is being recognised more and more every year, large shipments of the finest cattle being sent to the Continent, notably Denmark, a country which is noted for its thorough systematic dairy management. As far back as 1837, for the promotion of dairying, the Massachusetts Society, in America, imported some Ayrshires, one of which yielded 16 lb. of butter weekly for a considerable time on grass feed only. During my experience of dairying in Queensland, I have found that my return from Ayrshires was far in advance of that from any other breed; as an instance, I might mention the cow "Daisy," here illustrated, which was champion at Brisbane in 1886-87-88, and which died of milk-fever on 9th September, 1889. Her milking record for six weeks after calving was 6½

Plate OLVI.



AYRSHIRE COW, "DAISY."
(Champion 1886-7-8.)

gallons per day, and the feed had to be withdrawn from her before calving. The Ayrshire inherits a hardy constitution, and can stand a good deal of exposure, but when she is well taken care of she more than repays the trouble.

It is scarcely necessary that I should touch on the points of the Ayrshire cattle, as I gave them some time ago to the Hon. A. J. Thynne, accompanied by some photos of cattle which I brought from home. These appeared in the *Journal* in due course (Vol. I., p. 362, 1897), also the points adopted by the Ayrshire Agricultural Society in 1885. There is no material difference in the judging at Ayr since '84, but I noticed during my last visit a marked improvement in the dairy herds throughout Scotland, and the position of judge at one of the great shows was no sinecure.

As regards the treatment of the Ayrshire, it seems to be the opinion amongst many of the dairymen here that it does not pay to feed well. My experience proves that it does, and the better the quality of the feed given, and the more attention paid to the housing of your cows, all other things being equal, the heavier will your credit balance be at your bankers. While it is true that the Ayrshire is of a hardy constitution, she must be well cared for to produce the best results. Our feed usually consisted of good oaten and lucerne chaff, well cut, mixed with chaffed greenstuff. This was then mixed with pollard moistened with water, and then all these ingredients were thoroughly mixed in a large tub. This was given twice daily, and since I built my new byre at Ayrshire Dairy, Eagle Farm, we always have housed the cattle during the cold winter nights. My experience is, that it pays handsomely to look well after your herd, and though you only keep half the number, see that they are of the right stamp, and not only will it take less feed to keep them, but less labour is required. It does not pay to keep "scrubbers" here, though to see the herds of some farmers one would think they were of a contrary opinion.

There can be no question as to the superiority of the Ayrshire as a good all-round cow for the production of milk, cheese, or butter, and I am confident that if the proper breed were established here, they would grow in favour. The Government have done a great deal to promote the dairying industry here—first by the travelling dairy, then by assisting in the building of cheese and butter factories, and again by endeavouring to instruct farmers as to the proper class of cattle to breed. Present prices paid both at the butter and cheese factories pay the farmer well, and the line along which he must advance is by improving the strain of his milkers. The laying past of a sufficient stock of feed for winter use is also of the greatest importance, as in too many cases still, the farmer's cows are like the moorland farmer's horse at home, "They grow in summer, and become poor in winter." During my experience here as a dairy farmer, I have bred mostly from New Zealand stock, the pedigrees of which were signed by Messrs. A. and J. McFarlane, of Dunedin, but were the expense not almost prohibitive, I would have liked to import some of the pure-bred Ayrshires from the county they take their name from. I had the pleasure of attending the great cattle show at Ayr in 1895, and it was a revelation to me of the perfection to which this noted breed of cattle had been brought. Ayrshires here were viewed with disfavour for some years through dealers (not breeders) bringing over shipments from New Zealand of grade, or rather mongrel cattle. These were sold as Ayrshires, and pedigrees given, but unskilled purchasers were sadly disappointed with the results obtained. The fact is that the proper breed is unknown here, and with the exception of a very few, none of them would gain a prize at even the smallest local show in Ayrshire. I intended at first to breed bulls for sale at our annual exhibition, but there being such a poor demand, low prices, and so little interest shown by the farmers in dairy cattle, that I decided not to go on with the business. Altogether, I have taken 10 champion prizes since 1886, besides a great number of others, although for five years I did not exhibit, owing to the lack of interest taken in the breed.

Our dairying industry is yet in its infancy, though we have made great strides during the last ten years, and seeing that now our production has overtaken the local demand, we must be able to meet foreign producers in the great

markets of the world and beat them. We now have factories equipped with the latest machinery, up-to-date methods of packing and handling, transport by high-class refrigerating steamers, and our surplus is available when the markets of the old world are at their highest. The next advance must be taken by the farmer in the selection of the highest grade of cattle, Ayrshire or otherwise. Careful attention to feeding, housing, and general management, and that being attained, I predict that before many years have elapsed, Queensland will fall into line with the great dairy exporting colonies of New South Wales and Victoria.

[In the matter of prizes for Ayrshire cattle, Mr. Stewart has been remarkably successful, having since 1885 taken no less than 23 firsts, 9 seconds, and 5 champion prizes. We should have been pleased to be able to give all the pedigrees and milking performances of Mr. Stewart's cows, but want of space precludes their publication.—Ed. *Q.A.J.*]

PEDIGREES OF COWS AND BULL ILLUSTRATED IN THIS JOURNAL.

DAISY.

Red and white spotted. Sire, Carligan 4th; dam, Nora, by Kilbride (in calf to young Sir Redmond); dam, Flower (an imported cow).

A. AND J. MCFARLANE.

Dunedin, 15th December, 1885.

The above cow was bred by W. Cowan, Esq., Waikonatia, Dunedin, New Zealand, and was champion at Brisbane in 1886, 1887, and 1888. She was remarkable for her milking, and we had to withdraw feed to make her dry before calving. Her record for six weeks after calving was 65 lb. per day, and she died of milk-fever on 9th September, 1889.

PEGGY.

Champion at Brisbane, 1899. Sire, Ayrshire Jock; dam, Janet; sire, Gemmell's Champion; g dam, Craig's Daisy.

NAN.

Reserve Champion, 1899. Sire, Prince; dam, Peggy; sire, Ayrshire Jock; g dam Janet; g g sire, Gemmell's Champion; g g dam, Craig's Daisy.

BEAUTY 2ND.

First prize at Brisbane, 1899, for three-year-old heifer. Sire, Prince; dam, Peggie; g sire, Ayrshire Jock; g dam, Janet; g g sire, Gemmell's Champion; g g dam, Craig's Daisy.

PEGGY.

Champion at Brisbane, 1899, with Nan Reserve Champion, and Beauty 2nd, gained two special prizes for cow and two progeny. First, by Marshal and Slade, £2 12s. 6d.; second, by Stewart and Walker, £2 2s.

PEDIGREE OF AYRSHIRE BULL, PRINCE.

Calved 17th April, 1889. Out of Primrose 2nd of Oakbank, by Ada's Ear of Oakbank; Primrose 2nd, by Oakbank.

Sire—Jock of Oakbank.

Dam—Primrose of Oakbank, by Southern Chief.

g d Primrose, by Rival of Drumlanrig.

g g d Susie, by Dunlop.

g g g d Katie 2nd, by Rob Roy.

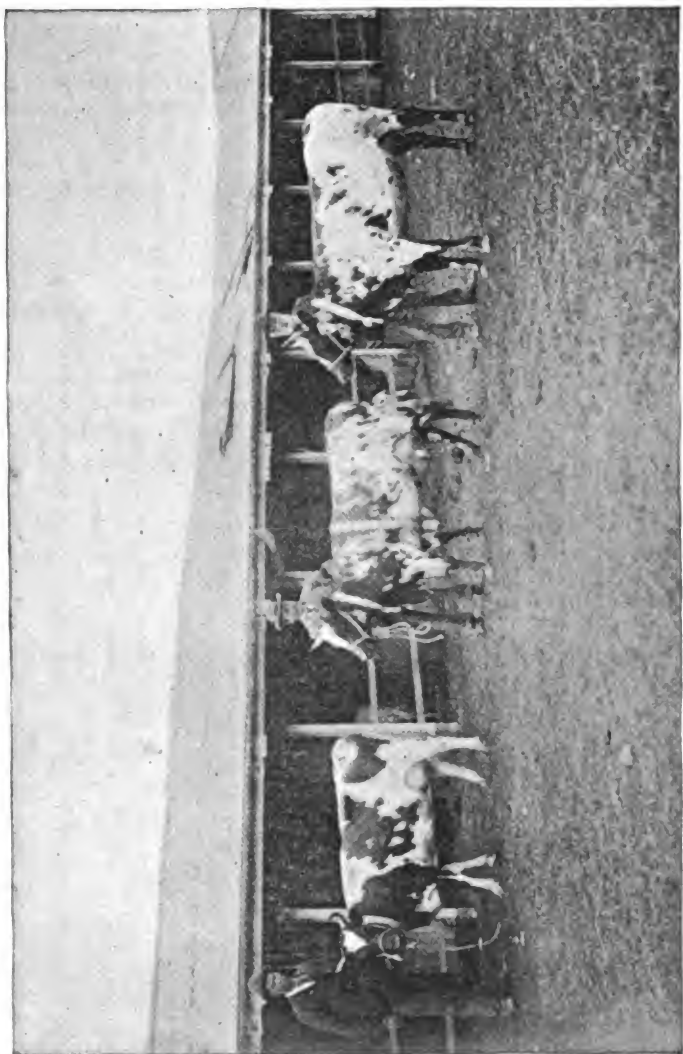
g g g g d Mollie, by Bob.

g g g g g d Maggie.

g g g g g g d Annie (imported).

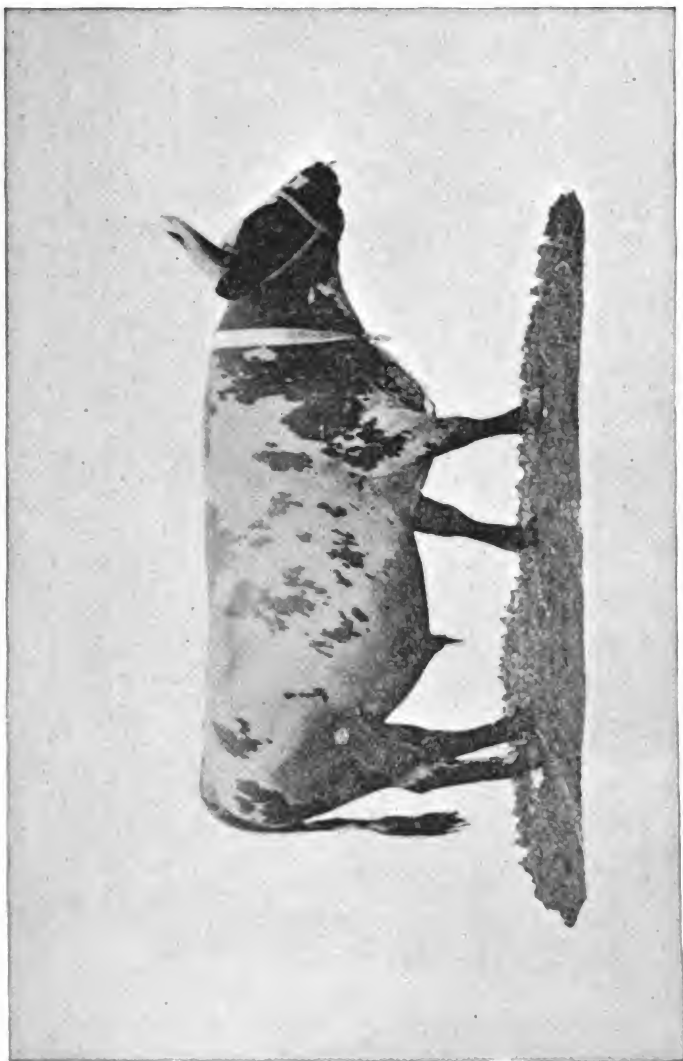
Bred from McNab Bros.' stock.

Plate CLVII.



CHAMPION AYRSHIRE COW, 1899, "PEGGY," AND PROGENY "NAN" AND "BEAUTY" 2nd.

Plate CLVIII.



CHAMPION AYRSHIRE BULL, "PRINCE."

THE DAIRY HERD.
QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST OCTOBER, 1899.

| Name of Cow. | Breed. | Date of Calving. | Yield. | Per cent. Butter Fat, Babcock Test. | Com- mercial Butter. | Remarks. |
|---------------|-----------------|------------------|------------|---|----------------------------|-----------------|
| Annie Laurie* | Ayrshire... | 12 June, 1899 | Lb. 786 | 3.0 | 26.4 | |
| Blink | " | 23 April | 569 | 3.8 | 24.2 | |
| Isabelle | " | 2 June | 531 | 3.1 | 18.43 | |
| Lena | " | 17 June | 724 | 3.6 | 29.18 | |
| Linnet | " | 19 June | 845 | 2.9 | 27.4 | |
| Rosebud | " | 13 April | 565 | 3.3 | 20.87 | |
| Ream | " | 13 Aug. | 571 | 3.8 | 24.29 | |
| Leesome | " | 12 Oct. | 613 | 3.4 | 23.34 | |
| Ream Routhie* | " | 19 Sept. | 691 | 3.7 | 28.62 | |
| Baroness | Jersey | 13 June | 130 | 4.5 | 6.55 | Dry, 16-10-99 |
| Content | " | 11 July | 585 | 4.1 | 26.85 | |
| Eileen* | " | 13 Aug. | 645 | 4.3 | 31.05 | |
| Jersey Belle | " | 4 July | 548 | 4.3 | 26.38 | |
| Stumpy* | " | 1 July | 727 | 4.7 | 38.26 | |
| Playful | " | 6 Aug. | 533 | 4.4 | 26.26 | |
| Ivy | " | 2 Oct. | 431 | 4.2 | 20.27 | With first calf |
| Beatrice | " | 19 Oct. | 168 | 3.8 | 7.14 | |
| Connie | " | 29 Sept. | 496 | 4.3 | 23.87 | " |
| Fancy | South Coast | 7 May | 540 | 3.7 | 22.37 | |
| Scarlet | " | 13 Oct. | 421 | 3.7 | 17.43 | |
| Misery | " | 4 May | 531 | 2.8 | 16.64 | |
| Toughy* | " | 11 Sept. | 689 | 3.2 | 24.68 | |
| Banjo | Devon | 5 Oct. | 374 | 3.8 | 15.91 | |
| Broad | " | 5 Oct. | 539 | 3.9 | 26.16 | |
| Rosie | " | 11 Oct. | 370 | 4.2 | 17.4 | |
| Topay | " | 18 Oct. | 202 | 3.8 | 8.59 | |
| Monday | " | 24 Oct. | 142 | 3.3 | 5.24 | |
| Patience | " | 5 Oct. | 363 | 3.8 | 15.44 | |
| Gertie | Shorthorn | 3 June | 545 | 3.6 | 21.97 | |
| Spot | " | 17 Oct. | 270 | 4.0 | 12.09 | With first calf |
| May | " | 26 May | 258 | 3.8 | 10.97 | |
| Nestor | " | 27 Feb. | 458 | 3.2 | 16.4 | " |
| Plover | " | 25 April | 685 | 3.5 | 26.84 | " |
| Queenie | " | 20 April | 567 | 3.8 | 24.12 | " |
| Painter | " | 4 Sept. | 789 | 3.5 | 30.92 | " |
| Brush | " | 12 Sept. | 814 | 3.8 | 34.64 | " |
| Blossom | " | 14 Sept. | 735 | 3.7 | 30.44 | " |
| Florrie | " | 15 Sept. | 741 | 3.3 | 27.38 | " |
| Kit | " | 16 Sept. | 698 | 3.7 | 28.91 | " |
| Frizzy | " | 27 Sept. | 618 | 3.2 | 22.14 | " |
| Kate | " | 30 Aug. | 463 | 3.6 | 18.65 | " |
| Violet | " | 1 Oct. | 632 | 3.7 | 26.18 | " |
| Laurel | " | 4 Oct. | 796 | 3.3 | 29.41 | " |
| Restless | " | 4 Oct. | 785 | 2.9 | 25.49 | " |
| Rosella | " | 9 Oct. | 618 | 3.8 | 26.29 | " |
| Redmond | " | 6 Oct. | 681 | 3.3 | 25.16 | " |
| Jane | " | 11 Oct. | 472 | 3.9 | 20.6 | " |
| Shelly | " | 13 Oct. | 337 | 3.9 | 14.71 | " |
| Peggy | " | 14 July | 463 | 4.0 | 20.74 | " |
| Stranger | " | 15 Aug. | 754 | 3.2 | 27.01 | " |
| Empress | " | 23 Aug. | 703 | 3.4 | 26.76 | " |
| Mundah | " | 29 Sept. | 724 | 2.8 | 22.7 | " |
| Pokey | Grade | 26 Sept. | 547 | 3.6 | 22.05 | " |
| Sally | " | 23 Sept. | 746 | 2.4 | 20.04 | " |
| Rose | " | 11 Feb. | 516 | 3.2 | 18.49 | " |
| Whiteflank* | South Coast | 4 June | 716 | 3.6 | 28.86 | " |
| Star | " | 17 Dec., 1898 | 656 | 3.6 | 26.44 | " |
| Roany | " | 12 June, 1899 | 587 | 3.9 | 25.61 | " |
| Ranger | " | 9 June | 533 | 4.1 | 24.47 | " |
| Lady | " | 6 April | 123 | 3.0 | 4.13 | Dry, 15-10-99 |
| Ginger | Grade Shorthorn | 17 June | 561 | 3.9 | 24.49 | |
| Biddy | " | 18 May | 679 | 3.8 | 24.89 | |
| Bally | " | 12 Oct. | 506 | 3.1 | 17.56 | |
| Beauty | " | 14 Oct. | 461 | 3.0 | 15.48 | |
| Leopard | " | 17 Oct. | 241 | 3.2 | 8.63 | |
| Trial | " | 26 Oct. | 88 | 3.7 | 3.65 | |
| Duchess | " | 27 Oct. | 91 | 3.9 | 3.96 | |
| Pet | Jersey | 6 Oct. | 486 | 3.4 | 18.50 | |

The cows during the period covered by the above report, with the exception of six head, were grazed in the railway paddock during the day and in the home paddock during the night.

Those marked * were under test on a variety of fodders, particulars of which are given below :—

FEEDING ON ORDINARY PASTURE FOR SEVEN DAYS, COMMENCING ON 5TH OCTOBER.

| Cow. | 5 Oct. | | | 6 Oct. | | | 7 Oct. | | | 8 Oct. | | | 9 Oct. | | | 10 Oct. | | | 11 Oct. | | |
|-------------------|--------|--------|---------|--------|--------|---------|--------|--------|---------|--------|--------|---------|--------|--------|---------|---------|--------|---------|---------|--------|---------|
| | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. |
| Annie Laurie (A.) | 1b | 24 3.3 | 88 | 1b | 24 3.2 | 86 | 1b | 21 3.3 | 77 | 1b | 25 3.1 | 86 | 1b | 23 3.3 | 85 | 1b | 24 3.3 | 84 | 1b | 24 3.1 | 83 |
| Eileen (J.) | 22 5.1 | 1.19 | 18 4.6 | 22 5.1 | 1.19 | 18 4.6 | 22 5.1 | 1.19 | 18 4.6 | 22 5.1 | 1.19 | 18 4.6 | 22 5.1 | 1.19 | 18 4.6 | 22 5.1 | 1.19 | 18 4.6 | 22 5.1 | 1.19 | 18 4.6 |
| Ream Ruthie (A.) | 25 3.5 | 98 | 24 3.7 | 25 3.5 | 98 | 24 3.7 | 25 3.5 | 98 | 24 3.7 | 25 3.5 | 98 | 24 3.7 | 25 3.5 | 98 | 24 3.7 | 25 3.5 | 98 | 24 3.7 | 25 3.5 | 98 | 24 3.7 |
| Whiteflank (S.C.) | 19 4.4 | 72 | 22 3.7 | 19 4.4 | 72 | 22 3.7 | 19 4.4 | 72 | 22 3.7 | 19 4.4 | 72 | 22 3.7 | 19 4.4 | 72 | 22 3.7 | 19 4.4 | 72 | 22 3.7 | 19 4.4 | 72 | 22 3.7 |
| Stumpy (J.) | 25 5.0 | 1.4 | 22 5.0 | 25 5.0 | 1.4 | 22 5.0 | 25 5.0 | 1.4 | 22 5.0 | 25 5.0 | 1.4 | 22 5.0 | 25 5.0 | 1.4 | 22 5.0 | 25 5.0 | 1.4 | 22 5.0 | 25 5.0 | 1.4 | 22 5.0 |
| Toughy (S.C.) | 21 2.6 | 61 | 21 3.1 | 21 2.6 | 61 | 21 3.1 | 21 2.6 | 61 | 21 3.1 | 21 2.6 | 61 | 21 3.1 | 21 2.6 | 61 | 21 3.1 | 21 2.6 | 61 | 21 3.1 | 21 2.6 | 61 | 21 3.1 |

(A.) indicates Ayrshire; (J.) Jersey; (S.C.) South Coast.

TOTAL YIELDS, 5TH TO 11TH OCTOBER.

| Name of Cow. | Milk. | Average Test. | Butter. |
|-------------------|-------|---------------|---------|
| Annie Laurie (A.) | 1b | | 1b |
| Eileen (J.) | 164 | 3.2 | 5.99 |
| Ream Ruthie (A.) | 142 | 4.4 | 6.98 |
| Whiteflank (S.C.) | 108 | 3.6 | 6.85 |
| Stumpy (J.) | 149 | 3.6 | 6.06 |
| Toughy (S.C.) | 161 | 4.9 | 8.81 |
| | 146 | 3.0 | 4.85 |

These experiments were made with six cows from the College herd.

Annie Laurie and Ream Ruthie are Ayrshires; Stumpy and Eileen are Jerseys; Toughy is a South Coast cow; Whiteflank is a grade Shorthorn. Many other animals in the herd are giving far greater yields than several of the above cows, but the latter are suitable for the purpose, as they are accustomed to stall-feeding. For the first week they were allowed to feed as usual in the paddocks, no extra food being given. For the next two weeks they were fed on bran, cow-pea chaff, and molasses, the quantities being given elsewhere. A very slight increase was made as regards quantity of milk, and the proportion of butter-fat was practically unchanged.

FEEDING ON CHAFF, BRAN, AND MOLASSES AND ORDINARY PASTURE FROM 1.1TH TO 25TH OCTOBER.

| Cow. | 12 Oct. | | | 13 Oct. | | | 14 Oct. | | | 15 Oct. | | | 16 Oct. | | | 17 Oct. | | | 18 Oct. | | |
|--------------|---------|--------|---------|---------|--------|---------|---------|--------|---------|---------|--------|---------|---------|--------|---------|---------|--------|---------|---------|--------|---------|
| | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. |
| Annie Laurie | 1b | 25 3.1 | 83 | 1b | 24 3.2 | 86 | 1b | 24 3.3 | 88 | 1b | 24 3.1 | 83 | 1b | 25 3.3 | 93 | 1b | 25 3.3 | 92 | 1b | 24 3.2 | 86 |
| Eileen | 21 4.6 | 1.07 | 21 4.0 | 21 4.6 | 1.07 | 21 4.0 | 21 4.6 | 1.07 | 21 4.0 | 21 4.6 | 1.07 | 21 4.0 | 21 4.6 | 1.07 | 21 4.0 | 21 4.6 | 1.07 | 21 4.0 | 21 4.6 | 1.07 | 21 4.0 |
| Ream Ruthie | 20 3.7 | 83 | 21 3.1 | 20 3.7 | 83 | 21 3.1 | 20 3.7 | 83 | 21 3.1 | 20 3.7 | 83 | 21 3.1 | 20 3.7 | 83 | 21 3.1 | 20 3.7 | 83 | 21 3.1 | 20 3.7 | 83 | 21 3.1 |
| Whiteflank | 21 3.6 | 84 | 22 3.5 | 21 3.6 | 84 | 22 3.5 | 21 3.6 | 84 | 22 3.5 | 21 3.6 | 84 | 22 3.5 | 21 3.6 | 84 | 22 3.5 | 21 3.6 | 84 | 22 3.5 | 21 3.6 | 84 | 22 3.5 |
| Stumpy | 23 5.0 | 1.27 | 22 5.0 | 23 5.0 | 1.27 | 22 5.0 | 23 5.0 | 1.27 | 22 5.0 | 23 5.0 | 1.27 | 22 5.0 | 23 5.0 | 1.27 | 22 5.0 | 23 5.0 | 1.27 | 22 5.0 | 23 5.0 | 1.27 | 22 5.0 |
| Toughy | 22 3.1 | 76 | 22 3.1 | 22 3.1 | 76 | 22 3.1 | 22 3.1 | 76 | 22 3.1 | 22 3.1 | 76 | 22 3.1 | 22 3.1 | 76 | 22 3.1 | 22 3.1 | 76 | 22 3.1 | 22 3.1 | 76 | 22 3.1 |

| Cow. | 19 Oct. | | | 20 Oct. | | | 21 Oct. | | | 22 Oct. | | | 23 Oct. | | | 24 Oct. ¹ | | | 25 Oct. | | |
|------------------|---------|--------|---------|---------|--------|---------|---------|--------|---------|---------|--------|---------|---------|--------|---------|----------------------|--------|---------|---------|--------|---------|
| | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. | Milk. | Test. | Butter. |
| Annie Laurie ... | lb. | 25 3.3 | .92 | lb. | 23 3.1 | .79 | lb. | 23 3.3 | .84 | lb. | 27 3.2 | .93 | lb. | 25 3.1 | .86 | lb. | 25 3.1 | .86 | lb. | 23 3.3 | .92 |
| Eileen ... | ... | 22 4.1 | 1.01 | ... | 22 4.4 | 1.07 | ... | 20 4.6 | 1.03 | ... | 19 5.0 | 1.06 | ... | 23 4.7 | 1.21 | ... | 23 5.0 | 1.28 | ... | 20 4.8 | 1.07 |
| Beam Ruthie ... | ... | 23 3.7 | .95 | ... | 21 3.6 | .85 | ... | 26 3.4 | .93 | ... | 26 3.4 | .98 | ... | 21 3.7 | .99 | ... | 20 3.7 | .83 | ... | 19 3.8 | .81 |
| Whitflank ... | ... | 22 3.5 | .86 | ... | 24 3.5 | .94 | ... | 20 3.7 | .83 | ... | 21 3.6 | .83 | ... | 22 3.4 | .83 | ... | 22 3.4 | .83 | ... | 24 3.8 | 1.02 |
| Stumpy ... | ... | 23 5.0 | 1.28 | ... | 22 5.0 | 1.23 | ... | 23 4.9 | 1.25 | ... | 25 4.6 | 1.29 | ... | 27 4.7 | 1.41 | ... | 26 4.9 | 1.42 | ... | 21 5.0 | 1.17 |
| Toughy ... | ... | 22 3.0 | .76 | ... | 24 2.9 | .77 | ... | 22 3.1 | .76 | ... | 24 3.0 | .80 | ... | 23 3.3 | .85 | ... | 23 3.2 | .82 | ... | 21 3.2 | .75 |

TOTAL YIELDS.

| 12TH TO 18TH OCTOBER. | | | | 19TH TO 25TH OCTOBER. | | | |
|-----------------------|-------|---------------|---------|-----------------------|---------------|---------|--|
| Name of Cow. | Milk. | Average Test. | Butter. | Milk. | Average Test. | Butter. | |
| | lb. | | lb. | lb. | | lb. | |
| Annie Laurie ... | 172 | 3.2 | 6.14 | 171 | 3.2 | 6.15 | |
| Eileen ... | 143 | 4.6 | 7.25 | 149 | 4.6 | 7.73 | |
| Beam Ruthie ... | 157 | 3.5 | 6.15 | 159 | 3.6 | 6.39 | |
| Whitflank ... | 156 | 3.6 | 6.21 | 155 | 3.5 | 6.16 | |
| Stumpy ... | 161 | 4.8 | 8.54 | 167 | 4.9 | 9.06 | |
| Toughy ... | 154 | 3.1 | 5.40 | 159 | 3.1 | 5.50 | |

RATION FED TO THE COWS FROM 12TH TO 25TH OCTOBER.

10 lb. cow-pea chaff.

2 lb. bran.

1 quart molasses (mixed with four times its bulk of water).

This ration was fed twice a day.

TO TELL THE AGE OF CATTLE.

THE first ring at three years, and a ring on the horn for each succeeding year, is the usual way of reckoning; but as these can be rasped off, and some breeds do not have horns, it is advisable to determine certainly by the teeth. The unimproved long horns, and other old-fashioned breeds which were long in coming to maturity, were later in the putting up of the teeth; but the following table, drawn by Professor Simonds, is reliable for Shorthorns and others which mature early. The same order is maintained as regards the front teeth or incisors in all animals—namely, the two to come through first are the central; the next pair consists of one on each side of them, and again one on each side of the laterals, the outer laterals following until the number (eight in the ox) is completed. The molars, or grinding teeth, also afford evidence to those able to distinguish them, but for all practical purposes the age is nearly enough ascertained by the number and development of the incisors. A rough-and-ready way of remembering is, first pair at one year and nine months; second pair at two years and three months; and so on, each pair being about six months later than the previous ones in breaking the gum. As soon as the mouth is "full," or complete, the teeth begin to show wear, and gradually separate, as well as look narrower, and have interdental spaces, which go on increasing until, very old animals, they fall out and leave gaps.

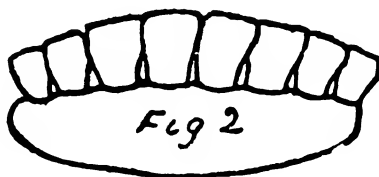
| Simonds's Table of Early Average. Improved Breeds. | | | Simonds's Table of Late Average. Improved Breeds. | | | Girard's Table of Late Average. Unimproved Breeds. | | |
|---|---------------|--------------------|--|---------------|--------------------|---|---------------|--------------------|
| Y. M. | No. of Teeth. | | Y. M. | No. of Teeth. | | Y. M. | No. of Teeth. | |
| 1 9 | 2 | permanent incisors | 2 3 | 2 | permanent incisors | 2 3 | 2 | permanent incisors |
| 2 3 | 4 | " " | 2 9 | 4 | " " | 3 0 | 4 | " " |
| 2 9 | 6 | " " | 3 3 | 6 | " " | 4 0 | 6 | " " |
| 3 3 | 8 | " " | 3 9 | 8 | " " | 5 0 | 1 | " " |

—*Farmer and Stockbreeder.*

A WRITER in an American exchange says:—I have always regarded the horns of very small importance in showing the age of the cow when buying. It is true that the horns indicate the age, but not always accurately. The rings usually begin to come with the first calf. For instance, if a heifer drops her first calf at two years old, the first ring counts two: but if she does not calve until three, then the first ring counts three years. After the cow gets along in years, the most important thing on which her continuance of usefulness depends is the condition of her teeth. Generally, as long as her teeth last, she will continue to do well in the dairy; but when these fail, she will begin to go down hill. Therefore, it is never safe to buy a cow without looking at her teeth, for some fail sooner than others. For the benefit of those who are not in the habit of examining the teeth of the cow, I will describe their appearance at various stages. In determining the age of the cow, it is necessary only to examine the front teeth of the lower jaw—I say "lower" jaw, because a man came to buy a cow of me some time ago, and objected to taking her because she had no upper front teeth. The calf has eight small milk teeth; but when nearing two years old, the two middle ones are replaced by two permanent and much larger ones, when her mouth presents the appearance of the upper part of Fig. 1.



The two next ones come at three or a little before, two more at four, and at five years old the cow has a full mouth, much like those shown in the centre of Fig. 2.



The two middle ones are at this time about $\frac{3}{4}$ -inch long, with the others growing shorter to the outside. After this the teeth grow shorter every year, and at seven years we may expect to find the teeth not much over $\frac{1}{2}$ -inch in length. They keep on wearing off until, at nine or ten years, they are very much shorter, and seem narrower, also, barely touching each other. The gums also begin to shrink away, until sometimes a tooth or two may get knocked

out by biting something hard. A good 10-year-old mouth is presented in Fig. 3. By looking at the teeth of cows of which one knows the age, he may soon



become well acquainted with their appearance. While it is impossible to tell exactly the age of a cow when over five years old, still one may judge near enough for all practical purposes. If a cow's mouth presents an 8-year-old appearance, it does not make much difference if she is nine or ten. She will, in all probability, last as long as the average 8-year-old cow. Dealers will often insist that the 10-year-old mouth here illustrated belongs to the 7-year-old cow; but that is no reason why the buyer should be deceived. He can easily learn for himself.

The Horse.

STABLE NOTES.

By W C QUINNELL, M.R.C.V.S.

DISEASES OF HORSES.

STRANGLES.

Treatment.—In regard to general management and treatment: In the first place, infected animals should be isolated as quickly as possible, and carefully watched. Having then isolated the diseased animals, and having placed them in perfect sanitary surroundings, the next step should be the thorough disinfection of the contaminated stables, when empty, by the means of sulphur fumes. This is really a most important precaution, and should never be neglected by those who desire their stables to be kept in a healthy condition. Animals suffering from strangles should be placed in a moderately warm and well-ventilated, but not draughty horse-box. Being an eruptive disease, and like all eruptive diseases, must run a certain specific course, one should endeavour, in the treatment of strangles, to assist nature as far as possible in the development of the eruptive condition. If the eruption is hindered in the external part, where it is usual for it to appear, it is apt to shift to another part of the body; the internal organs may be attacked, and serious trouble would follow.

As fever and sore throat accompany this disease, we must endeavour to maintain the strength of the animal, and as the sore throat prevents the animal from taking nothing else but soft food, this difficulty may be overcome to a great measure, and recovery much accelerated by careful nursing. The patient's appetite must be carefully watched and tempted; sloppy diet, such as bran and linseed mash, boiled barley, or oatmeal gruel, and other easily masticated food may be given, such as sliced carrots, freshly cut grass or hay steeped in boiling water; the infusion resulting from this, when cold, makes a suitable and palatable drink for horses with strangles. Stale bread and malt-mash are often eaten with relish.

Warmth must be applied to the surface of the body, and bandages to the legs, which should be removed at least twice a day, and the parts hand-rubbed until the friction produces sufficient warmth.

If constipation is present, this may be relieved by laxative food, or if necessary by enemas, though these are rarely required, but no strong purgative medicine must be given, for fear of diminishing or checking the course of the eruption, and also the chance of reducing the strength of the animal by superpurgation. If medicine be needed, $\frac{1}{2}$ pint of linseed oil may be given. If the fever runs very high, one or two drachms of quinine may be given in water as a drench two or three times a day until the fever is diminished.

Treatment of the Local Swelling.—Having given the general treatment in a case of glanders, we may now go on the treatment of the swelling between the branches of the lower jaw, in order to expedite the formation of an abscess; this swelling must have frequent application of fomentations and poultices. If the process of suppuration or formation of matter needs further assistance to bring it to maturity, a slight blister will produce the desired action. When the abscess is ready for opening, there will be noticed a prominence which is soft, and the hair has fallen off; as soon as an incision should be made, the matter will squirt out with great force. The incision must be kept open for a few days by inserting a small piece of lint or tow into the wound, so as to insure the complete evacuation of the contents; and it may occasionally be injected with warm water by means of a syringe, in order to keep the wound clean and preventing pus from collecting.

After-treatment consists simply in the continuance of good nursing and careful attention to the food, water, ventilation, and exercise of the patients.

LYMPHANGITIS.

Definition.—A constitutional affection, attended with inflammation, commencing in the lymphatic glands and spreading to the absorbents and blood-vessels of one of the limbs; in most cases a hind one, which becomes swollen.

In some cases both hind limbs are affected, and in rare instances a fore limb is the seat of the disease. The commonest seat, however, is the left hind leg.

This disorder is met with in well-fed horses and amongst heavy draught horses, caused by cessation or diminution of work suddenly, as seen frequently amongst animals after a Sunday's rest. In consequence the disease has been named *Monday morning disease*.

Symptoms.—The local inflammation of the limbs is frequently preceded by a rigor, which may last during some hours, and severity of the disease is shown, as a rule, by the intensity and duration of this shivering fit. There is restlessness and lameness at an early stage, and after the rigor has passed, the *hot stage* follows: quickened pulse, increased breathing and high fever; coincident with this, the leg or legs begin to swell, the glands in the groin are, perhaps, first noticed to be in a corded condition, and the swelling extending downwards until it reaches the hoof. There is great soreness and lameness in the limb or limbs, and the animal suffers so much that the body may often be noticed to be covered with perspiration.

The general and local symptoms continue to increase in severity for 24 to 48 hours, and then remain stationary, are followed in a day or two by defervescence of the fever and gradual absorption of the local extravasations which slowly reduces the swelling.

Treatment.—A full dose of physic should be immediately given, and an enema administered, while sloppy food or grass ought only to be given as diet.

Hot fomentations persisted with for several hours, and limb then lightly swathed in woollen or hay bandages.

Where limb tender and painful after fomenting moisten with soap liniment and laudanum.

When weather cold, clothing needful to promote skin functions.

Stimulants useful where preliminary rigor severe or continued.

Aid removal of swelling by exercise and subsequently moderate work, smart friction of limb daily with oil.

Careful regulation of food, work, and rest, attention to diet, and exercise of susceptible subjects diminish chances of recurrence.

TELEGONY.

WHAT is telegony? Telegony is a distinct impression of a first impregnation on future progeny of the same sire. The *Live Stock Journal* says:—

The theory of telegony is one upon which scientific opinion is probably pretty equally divided at the present time. It is one of those problems in the science of stock-breeding requiring such careful observation over a necessarily extended period, that great time must elapse before definite facts can be recorded, if, indeed, they ever can be authentically ascertained so as to raise it from a possible theory to a well-founded truism. With the exception of Professor Cossar Ewart's experiments at Penicuik, few systematic attempts have been made in this country to solve the problem. It is one involving great expenditure, much labour and experience, careful observation, and the faithful recording of every detail, however insignificant, that bears upon the subject. On the completion of the Penicuik experiments much light may be thrown upon the question, which should be full of interest to all breeders of stock, and whether the experiments come to a successful issue or not, great credit is certainly due to Professor Cossar Ewart for his disinterested labours in this connection.

PREPOTENCY.

It is well known to breeders of all kinds of stock that pure-bred sires are more impressive than under-bred or cross-bred sires, and that by careful selection and mating along scientific lines, under-bred stock can be raised in time to come within the term "pure-bred." This accepted fact neither proves nor disproves telegony, but it seems natural to suppose that—were the original germ permanently situated by first sires—under-bred features would be more slowly worn out, and conversely, pure-bred characteristics would deteriorate less rapidly. It is held by many breeders that parents, of either sex, possessing the purer breeding and fixity of type, are the more prepotent, and that the progeny incline to whichever side the balance of breeding and type lies. Telegony, however, if it does exist—and although there may be no positive proof of its action, there are many apparent indications of it—necessarily emanates from original sires by the inoculation of the female ovum during coition. With pregnancy, saturation follows, and it is held that the original male strains always remain hermetically associated with the female blood to a varying degree in correspondence with the prepotency of individual sires. The characteristics of first sires may make themselves apparent in innumerable ways—in colour, conformation, constitution, and temperament, but they may be so slight that they are practically imperceptible, and, on the other hand, they may be so prominent as almost to bring the theory of telegony within the range of established truth. By continuous breeding the distinctive features of original sires are gradually reduced, though they may never absolutely disappear.

REVERSION AND VARIATION.

All breeders of stock are familiar with reversion, or atavism, as it is occasionally called, and even under the care of the most experienced breeders reversions occur from time to time in the most unaccountable manner. They are more frequent, however, during the formation of particular breeds of stock than when breeds are permanently fixed and established. This principle is borne out in all classes of stock; thus, in-and-in breeding, whilst in some cases it may lead to deterioration of size and delicacy of constitution when practised unscientifically, is no doubt responsible for the excellency of all kinds of British stock at the present day. But reversion and telegony are essentially distinct, because the former peculiarity may revert along the female just as easily as along the male line of descent, the balance naturally depending upon whichever parent possesses the greater prepotency. Telegony, as already explained, can only revert to original sires. In this way telegony, if it be accepted as a fact, must be understood to be absolutely separated from atavism and variation; on the other hand, if it only remain a hypothesis, it is difficult to say what is atavism and what is telegony, or to deny that both terms are identical in their application. Instead of reversion and variation being always consequent upon

the entrance of disturbing influences in the line of heredity, they are probably just as likely to occur from outside influences in environment, whether gradual or violent, during the impressionable period of gestation.

CROSSING.

Violent crossing is instrumental in producing many reversions and variations, and in arresting fecundity. This is exemplified in unfertile hybrids of all species, but this is probably more the experience of fanciers than regular commercial breeders; and although "like begets like," it is impossible to forecast the results when violent crossing is resorted to, as the type of progeny may radiate in all directions except the one desired. This is naturally a domestic observation, because the rigorous law of Nature precludes this intermingling amongst animals in a wild state.

The law of "the survival of the fittest," it is said, operates in the latter circumstances, and maintains each species in strength and purity; although, on the authority of the Duke of Argyll, in "Evolution Cross-examined," there is no more barren phrase in existence than that coined by Mr. Herbert Spencer. It can only be understood as a modification of Darwin's definition, and whether it may be regarded as an improvement on the original is, of course, open to debate. Little can be done by crossing to solve the problem of telegony; indeed, its effects will tend rather to confuse the issue, so that to arrive at reliable conclusions pure-bred animals are necessary for experimental purposes.

OUTSIDE INFLUENCES.

From the account of the spotted cattle produced by the ingenuity of Jacob, it would seem that he had divined their bovine susceptibilities and practised the method of increasing his individual estate on thoroughly scientific principles, because he supplied the wands that produced the charm, made some mathematical calculations, and determined the results with consummate skill. Besides the Biblical story, there are many records of freaks of nature due to outside influences occurring within the experience of most breeders. Whether those upsetting influences affect the germ at the time of copulation or are caused at a later and more impressionable stage of pregnancy, it is impossible to say, though scientific opinion inclines to favour the former rather than the latter theory. Sudden changes in environment, change of food, climatic influences, new companions, and occasional frights doubtless play a prominent part in the production of freaks and variations; indeed, these are well-worn facts which come within the everyday experience of most breeders of stock.

In no class of animals is the idea of telegony probably more clearly conveyed than in dogs, and most fanciers are very scrupulous in the use of first sires.

There is a tendency to narrow telegony down to a reproduction of colour and shape, and in the opinion of the writer this is a mistake, because if it can be proved to operate at all there is no reason why it should not manifest itself in all or any faculty both physical and mental. If this be admitted, the question becomes much more complicated and difficult of solution. Thus, as already mentioned, much time, careful study, and close observation are necessary to determine its authenticity.

Poultry.

SKIM MILK AS FOOD FOR YOUNG GROWING CHICKENS.

A VALUABLE AND PAINSTAKING EXPERIMENT.

THE fowls used in this experiment were 20 young chickens—10 Plymouth Rocks and 10 Houdans. They had, previous to the beginning of the experiment, been allowed to run at large together, getting the same feed, treatment, and care. The chickens selected were not uniform in size, but large and small were equally divided between the two lots. They were taken from two sittings—

one brood about two, and the other one and one-half, months old at the beginning of the experiment. The chickens were separated into two groups, known as lots 1 and 2, with five of each breed in a lot.

The food, care, and treatment of the two lots were identical, except that the fowls in lot 2 received, in addition to the food given in lot 1, all the skim milk they would drink. Both lots were given all they would eat of a mixed food consisting of two parts crushed maize, one part bran, and one part ground oats. They were fed three times a day, except on Sundays, when an increased amount of food was given at the morning and evening meals.

Weights were taken of the amounts of food given each lot, and of the refuse left from day to day. Both lots were given all they would consume of cracked bone, cabbage, lettuce, and water, of which no record was kept. The weights of all foods and of the fowls were recorded in ounces.

The following table shows the weight of each chicken and the total weight of both lots, taken on 11th July, last year, at the beginning of the experiment:—

TABLE I.
WEIGHTS IN OUNCES—JULY 11.

| LOT I.—WITHOUT MILK. | | LOT II.—WITH MILK. | |
|----------------------|---------|--------------------|---------|
| No. of Chicken. | Weight. | No. of Chicken. | Weight. |
| | Oz. | | Oz. |
| 1 | 19·0 | 5 | 16·0 |
| 2 | 16·5 | 6 | 13·0 |
| 3 | 10·0 | 7 | 11·0 |
| 4 | 15·5 | 9 | 12·0 |
| 8 | 9·5 | 10 | 14·5 |
| 12 | 10·0 | 11 | 19·0 |
| 14 | 9·0 | 13 | 9·0 |
| 15 | 14·5 | 17 | 12·0 |
| 16 | 8·0 | 18 | 7·0 |
| 20 | 9·0 | 19 | 7·0 |
| Total | 121 | Total | 120·5 |

The above table shows a difference of $\frac{1}{2}$ oz. in favour of lot 1 at the beginning of the experiment.

Table II. shows the total food consumed for each week, and the weekly weights of fowls during the entire experiment of eight weeks—

TABLE II.

| Date. | OUNCES OF FOOD CONSUMED. | | | WEIGHT OF FOWLS. | |
|----------------------|--------------------------|-------------|----------|------------------|---------|
| | Lot I. | Lot II. | — | Lot I. | Lot II. |
| | Mixed Feed. | Mixed Feed. | Milk. | Weight. | Weight. |
| | | | | Oz. | Oz. |
| 18 July | 182·5 | 285·5 | 39·0 | 181·5 | 152·0 |
| 25 " | 273·0 | 301·5 | 85·5 | 156·0 | 178·0 |
| 1 Aug. | 344·5 | 317·5 | 162·5 | 180·5 | 213·0 |
| 8 " | 474·5 | 498·5 | 278·5 | 220·0 | 277·0 |
| 15 " | 412·0 | 449·5 | 233·5 | *216·5 | 319·0 |
| 22 " | 384·0 | 514·5 | 299·5 | *250·0 | 394·5 |
| 29 " | 408·0 | 556·5 | 216·25 | *270·0 | 437·0 |
| 5 Sept. | 398·5 | 553·0 | 131·5 | *297·5 | 476·5 |
| Total Food consumed. | 179·8 lb. | 217·3 lb. | 90·4 lb. | | |

* Combined weight of nine chickens.

No. 2 from lot 1 died 18th August, leaving only nine in the lot.

From the above table it is shown that lot 2 consumed 37·5 lb. mixed feed more than lot 1, and 90·7 lb. of milk besides.

In Table III. is given the weekly gain for each lot and for each chicken during the experiment—

TABLE III.
WEEKLY GAIN PER LOT AND PER CHICKEN.

| LOT I.—WITHOUT MILK. | | | LOT II.—WITH MILK. | |
|-----------------------|-------------|---------------------------|--------------------|---------------------------|
| Date. | Total Gain. | Average Gain per Chicken. | Total Gain. | Average Gain per Chicken. |
| | Oz. | Oz. | Oz. | Oz. |
| 18 July | 10 5 | 1 05 | 31 5 | 3 15 |
| 25 " | 24 5 | 2 45 | 26 0 | 2 60 |
| 1 August | 24 5 | 2 45 | 35 0 | 3 50 |
| 8 " | 39 5 | 3 95 | 64 0 | 6 40 |
| 15 " | *24 5 | 2 73 | 42 0 | 4 20 |
| 22 " | *33 5 | 3 35 | 75 5 | 7 55 |
| 29 " | *20 0 | 2 22 | 43 5 | 4 35 |
| 5 Sept. | *27 5 | 2 75 | 39 5 | 3 95 |
| Average gain per week | ... | 2 62 | ... | 4 46 |

* Combined weight of nine fowls.

From the table it will be seen that both lots made the greatest gains during the same weeks—viz., 1st to 8th and 15th to 22nd August—indicating that both lots were alike susceptible to favourable external conditions.

In lot 1 there was slow increase in average gain, and it was very irregular throughout the experiment.

In lot 2 the increase in average gain was much more rapid, and continued for a longer period.

The mixed food consumed by the two lots during these periods—1st to 8th and 15th to 22nd August—was greater in amount than during some of the other periods, while the amount of milk consumed was greatest during these weeks. From this it appears that the great increase of average gain of lot 2 over lot 1 during these periods was largely due to the increased consumption of milk at that time.

From Tables II. and I. it is also shown that during any period when there is an increased consumption of milk in lot 2 there is a corresponding increase in the average gain during those periods and *vice versa*.

Table IV. shows the weights of each chicken in lots 1 and 2 at the beginning of the experiment (11th July) and at its close (5th September)—

TABLE IV.

| LOT I.—WITHOUT MILK. | | | LOT II.—WITH MILK. | | |
|----------------------|----------|---------|--------------------|----------|---------|
| No. Chicken. | Weights. | | No. Chicken. | Weights. | |
| | 11 July. | 5 Sept. | | 11 July. | 5 Sept. |
| | Oz. | Oz. | | Oz. | Oz. |
| 1 | 19 0 | 43 0 | 5 | 16 0 | 53 5 |
| 2 | 16 5 | * | 6 | 13 0 | 52 0 |
| 3 | 10 0 | 36 5 | 7 | 11 0 | 46 0 |
| 4 | 15 5 | 39 0 | 9 | 12 0 | 44 0 |
| 8 | 9 5 | 26 0 | 10 | 14 5 | 50 0 |
| 12 | 10 0 | 29 5 | 11 | 19 0 | 68 0 |
| 14 | 9 0 | 27 5 | 13 | 9 0 | 38 0 |
| 15 | 14 5 | 38 5 | 17 | 12 0 | 47 0 |
| 16 | 8 0 | 24 0 | 18 | 7 0 | 37 5 |
| 20 | 9 0 | 33 0 | 19 | 7 0 | 40 0 |

* Died 18th August

Summary showing Results of Experiments.

1. If skim milk be added to the ration fed to young chickens it will increase the consumption of the other foods given.
2. The great increase in average gain was coincident with the periods when the greatest amount of skim milk was consumed.
3. Skim milk is especially valuable as a food for young chickens during the hot dry weather, and becomes of less importance as the chicken grows older and the weather becomes cooler.—*Garden and Field.*

SHOULD EGGS BE WASHED ?

THE *Rural New Yorker* sent out this question to a number of poultry experts, and, as usual, views differ.

The *New York Produce Review* may take its eggs dirty if it likes, but I shall continue to ship mine clean. I have been producing about 1,000 dozen a month for years, and every egg goes into a pan of lukewarm water as soon as it has been gathered out of the nest. All dirt is easily removed after the eggs have been allowed to lie in warm water a few minutes, and the heat imparted to the egg by the warm water causes it to dry quickly, and gives it that fresh appearance peculiar to a new-laid egg. If the water hurts their keeping quality, I have never heard of it. This testimony probably has little value, as my eggs get into consumers' hands before they have time to spoil. A few years ago I filled a few glass fruit cans with eggs, and then filled the cans with sterilised water at a temperature of 155 degrees, sealing immediately. Eggs thus treated in December were in perfect condition after four months. The most expert chandler that I could find in the city said that they would pass anywhere for new-laid eggs, and Dr. W. E. Douglass, of Middleton, to whom I sent some, had them poached for his dinner-table, and said that no one at his table could tell them from new-laid eggs. The shells were in perfect condition so far as we could see, and the air cells smaller, if anything, than in a new-laid egg. I also tried some in the same way during the summer, but the water and eggs soon became tainted. From this I concluded that, although stated in the *New York Produce Review*, "wet eggs soon decay in wet weather," the cause is found in "warm weather," and not in "wet eggs."

Keep Eggs Dry.—The *New York Produce Review* is right. Eggs certainly are injured by washing. They will not keep so well or hatch so well as unwashed eggs. At least such has been my experience. The best that can be done for a soiled egg is to wipe it with a dry cloth; and, if the matter is important, carefully rasp the thickest of the dirt off with coarse sandpaper. If an egg is washed in either cold or warm water, it will be noticed at once that the "bloom" has disappeared, and a careful egg-buyer would at once pronounce it a stale egg. If only the fourth part of the shell is unsoiled, that part will show that the egg is fresh, because the "bloom" will be there. If you want eggs to keep well or hatch well, I would advise you to keep them out of water. Don't even rub them with a damp cloth. Keep them dry.—*Florida Agriculturist.*

WASHING WHITE OR LIGHT FEATHERED FOWLS FOR EXHIBITION.

By "CORINDA."

As Mr. Fred. Thompson, the famous Sydney breeder of Leghorns and White Wyandottes, was staying with me a few days previous to our late Exhibition in Brisbane, where he was so highly successful as an exhibitor, and as I was present at the time he washed his White Leghorns and Wyandottes, and perhaps rendered him slight assistance, I think I could not do better than describe his method. He half filled three ordinary washing tins the first one with nice

warm water, in which he dissolved a little borax; the second tin also with clean, warm, water, for a second wash, and the third tin clean, cold water, slightly blue.

He had several empty crates, with clean straw at the bottom, slightly raised from the ground to allow a free current of air, and it being a nice, warm day, he placed the fowls when washed in these in the sun to dry. He used Sunlight soap, and washed every bird thoroughly. By that, I mean legs, head, comb, wattles, and, of course, all feathers; the worst of the dirt in the first tin, and then all feathers a second time in the second tin, and finally rinsed out all soap in the third water in No. 3 tin. He then squeezed out as much of the water as possible with his right hand, holding the bird in the left, then with an old towel dried them as well as possible, and finally placed them in the wicker coops, and in about three hours' time the birds were thoroughly dry, and as white as snow.

Mr. Thompson is a great believer in the old saying, that "if a thing is worth doing, it is worth doing well," and there is no doubt if washing white fowls is done carelessly and hurriedly, the result is that the birds look worse than if they were not washed at all. When dry, he rubbed a very little vaseline on the combs and wattles, being careful that none went on the feathers, and then dried the former with an old handkerchief. The process to many will, of course, seem tedious, but the enthusiastic exhibitor need not be told that no pains should be spared to show his birds in first-class order.

POULTRY NOTES.

Don't feed unsound or mouldy grain to the fowls.

OATS and wheat are a better grain feed for poultry than corn.

NEVER coddle or baby either old or young fowls. Provide them with suitable shelter, and allow them to use their discretion about keeping under cover—only be sure that you have things so that they can run to shelter if they want to. We can have healthy fowls by breeding from vigorous, healthy, mature stock from ancestors equally good. This will give us sturdy chicks if eggs are properly incubated—chicks kept growing with good care on free range. All our stock should be allowed warm, clean quarters, plenty of fresh air and sunlight, pure water, good, sound food, exercise, good care and freedom from vermin.—*American Poultry Journal*.

GREEN BONE.—Green bone contains several elements important in the feed of fowls, and is especially valuable as a stimulant of egg production. For chicks it should be cut as fine as possible, but this is not necessary for grown fowls. If the poultry have a range in which they can catch plenty of insects and worms they will need very little green bone, but if they are kept confined a small quantity, about half a handful, should be fed to each hen two or three times a week. As it is a highly concentrated feed, the hens may easily eat too much of it, or more than can be easily digested, unless mixed with bran or some other bulky feed.

PRESERVATION OF EGGS.

THE following is a report of experiments made at the Central Experiment Farm, Ottawa, Canada, of the two methods usually considered the best of preserving eggs. The experiments were conducted by Mr. Frank T. Shutt, chemist, Dominion Experiment Farm, and Mr. A. G. Gilbert, the poultry manager. Having received numerous inquiries from farmers during the past two months respecting the merits of "water glass" as a medium in which to keep eggs, we are led to think that certain conclusions drawn from an experiment, lately

brought to a close, with this and other preservatives will be of interest to your readers. The investigation was commenced last September, perfectly fresh eggs from the farm poultry house being used for the test, which consisted in immersing the eggs for varying lengths of time, from a few hours to six months, in (a) limewater, and (b) 10 per cent. solution of "water glass." Those eggs which were treated for a few hours, days, or weeks, as the case might be, were subsequently placed, together with the untreated eggs to be used as a check, in a rack within a drawer in the laboratory till the close of the experiment, 30th March, 1899. All the eggs were at a temperature from 65 degrees to 72 degrees Fahr. throughout the trial. The testing consisted in breaking the eggs into a glass and noting the appearance of the "white" and yolk, whether the yolk was stuck to the shell, size of air-space, odour, &c. The eggs were then poached and again the odour, appearance, &c., noted. Without giving in detail the results of the various trials, it may suffice for the present purposes to summarise the conclusions reached, as follows:—

CONCLUSIONS.

1. In no instance, either of treated or untreated eggs, were any "bad" eggs found.

2. In all cases where the eggs were not kept covered throughout the period of the test with the preservative solution, shrinkage of the contents had taken place, as shown by the larger air-space, less globular form of the yolk, and in many instances by the adherence of the yolk to the shell. The eggs treated for seven days and less with limewater showed somewhat less shrinkage than those treated a similar length of time with silicate of soda.

3. It would appear that limewater and "water glass" used continuously are equally efficacious in preventing shrinkage. They may also be said to give practically the same results as regards both external and internal appearances, flavour, &c., of the eggs preserved. Since "water glass" (silicate of soda) is more costly and more disagreeable to use than limewater, we could not from the present results recommend the former as the better preservative.

4. The albumen or "white" in all the preserved eggs was very faintly yellow (though not to the same degree in all the eggs), the tint becoming deeper on boiling.

5. No offensive odour was to be perceived from any of the eggs when broken, but in all instances a faint but peculiar musty or slate odour and flavour developed on poaching.

6. It is probable that no preservative will prevent the loss of flavour possessed by the fresh egg, but those which wholly exclude the air (and thus at the same time prevent shrinkage from evaporation) will be the most successful. Continual submergence is evidently better than treatment for a few days. The limewater may be made by putting 2 or 3 lb. of good fresh lime in 5 gallons of water, stirring well at intervals, for a few hours, and then allowed to settle. The clear supernatant fluid can then be poured over the eggs, which have been previously placed in a crock or water-tight barrel.

Some authorities recommend the addition of 1 lb. or so of salt to the limewater, but the writers are of the opinion that this is unnecessary, and probably leads to the imparting of a limy flavour to the eggs by inducing an interchange of the fluids within and without the egg. The all essential points to be remembered are:—(1) That the eggs to be preserved shall be perfectly fresh, and (2) that they shall be covered with the preservative fluid.

HOW CHICKS GROW.

THE following is an estimate given of the rate of increase in weight feed in ordinary conditions:—The eggs weigh 2 oz.; the newly-hatched chick weighs 1½ oz.; at one week old, 2 oz.; three weeks old, 6½ oz.; four weeks old, 10 oz.; five weeks old, 14 oz.; six weeks old, 18½ oz.; seven weeks old, 23½ oz.; nine weeks old, 32 oz.; ten weeks old, 36 oz.; eleven weeks old, 41 oz.—*Farmer and Stockbreeder.*

A LARGE DUCK FARM.

THE ordinary English farmer considers that a dozen or two dozen ducks about the farmyard are quite enough for his tastes, and too much if they are not strictly looked after. Of course, on poultry farms considerable numbers are kept, but as far as magnitude is concerned, anything on this side sinks into insignificance in comparison to some American duck farms. In Massachusetts there is a farm on which it is said 30,000 ducks are hatched and raised annually. There are many large farms in the same State, but this one carries the palm for size.—*Farmer and Stockbreeder.*

INDIAN RUNNER DUCKS.

MR. S. H. PITTMAN says:—My nine Indian runner ducks are still doing justice to their reputation, having laid 216 eggs for the month ending 20th October, making a total of 2,888 eggs for seventeen months' laying—an average of 321 each.

A PORTABLE POULTRY HOUSE.

MR. JOHN MAHON, Principal of the Queensland Agricultural College, forwards the accompanying illustration and description of a portable poultry-house, two of which have been constructed at the College from designs supplied by him. We heartily second the hope he expresses that Queensland "will eventually secure some considerable part of the trade at present confined to Russia, France, and other egg-producing countries." Victoria is now coming to the front in exporting eggs, as will be seen by the note we publish in this issue of a record shipment of eggs from that colony.

The illustration of a portable poultry house is taken from one of a number of photographs of buildings, &c., at the Gatton Agricultural College.

The cheapness and the simplicity of its construction are a recommendation in its favour, apart from the advantages it possesses. These advantages may be briefly stated to be—(1) portability, (2) cleanliness, and (3) ventilation.

The house is built in the form of a cube, excepting the roof. Its dimensions are 6 x 6 x 6 feet clear on the inside. The roof is of galvanised iron, painted with white refrigerating material. The walls are lined with chamfer boards to within 18 inches from the top; and, to secure ventilation, lattice work is filled in here, as shown in the illustration.

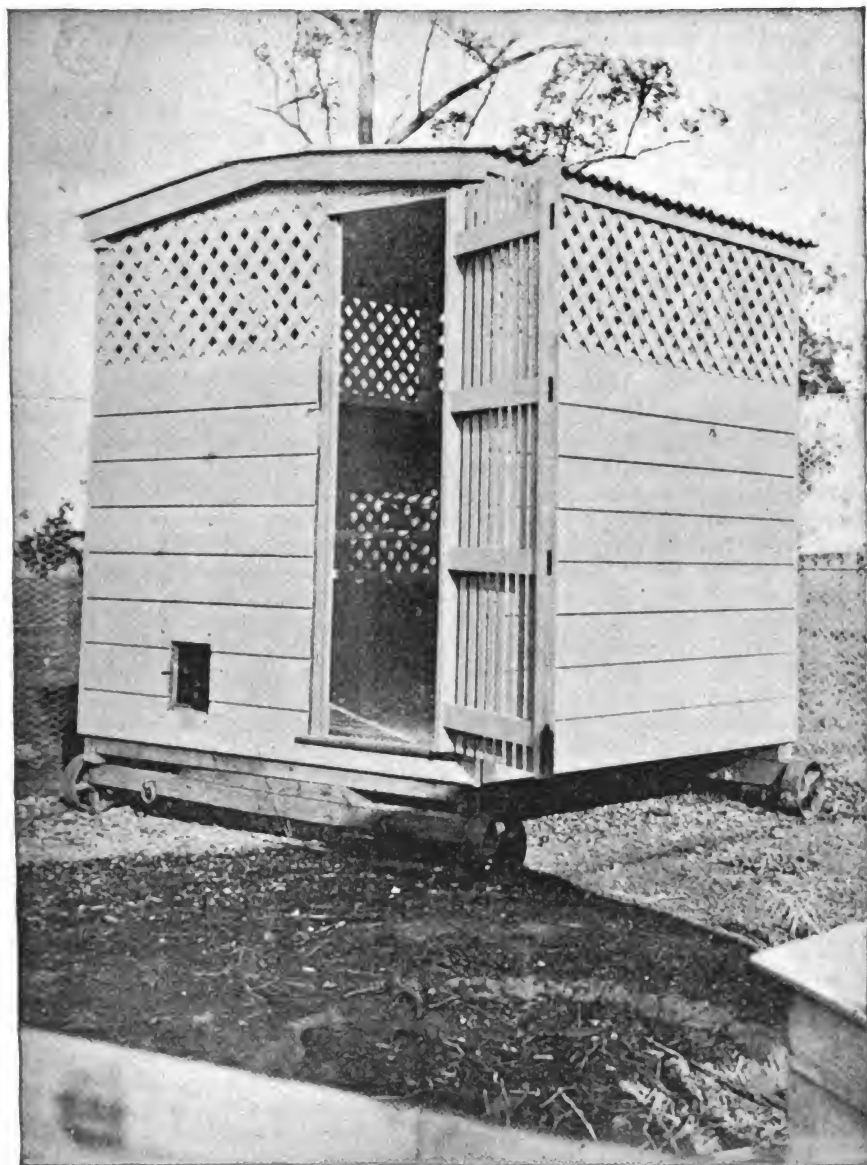
The floor is laid with 1 x 1 inch hardwood fillets three-quarter inch apart. This arrangement partly obviates and greatly facilitates cleaning. It also renders circulation of air from below complete, as may be experienced by entering the house on a hot day. The door is latticed, commanding a view of the greater part of the inside space, where the roosts are arranged with sufficient space to prevent interference. Three bars placed horizontally, and nailed to a slanting board attached at each end, carry about 40 fowls.

A small sliding door is seen in the illustration, which if closed at night serves to protect the chickens until the attendant opens it next morning.

The house is placed on a frame or under-carriage made of timber, 4 x 4 inches, to which are bolted the axles, made from round iron (1 inch diameter), flattened, and carrying four 9-inch diameter cast-iron trolley wheels. The front piece of the carriage swings on a kingbolt, enabling a driver to turn shortly without upsetting, when he wishes to remove the house from the poultry-yard to a stubble field for feeding purposes.

In cold weather the attendant may shut off the under circulation of air by boards fixed around the lower part of the house, and secured by angle brackets (angle bracket fixed to the lower boards), the necessary ventilation being supplied through the latticework above.

Plate CLIX.



PORTABLE FOWL-HOUSE—GATTON AGRICULTURAL COLLEGE.

The laying boxes are cheaply constructed from packing-cases. A sliding door is fitted to each box at the front. The rear part open may be placed against the wall, thus ensuring a closed-in nest for laying or sitting hens.

The total cost for each of the two built at the College is estimated at £6, apportioned as follows :—

| | £ | s. | d. |
|-------------------------------|-------|----|----|
| Four trolley wheels | 0 | 10 | 0 |
| Refrigerating material | 0 | 4 | 0 |
| Galvanised iron | 0 | 10 | 0 |
| Timber | 2 | 0 | 0 |
| Iron and nails | 0 | 5 | 0 |
| Carpenter's wages | 2 | 6 | 0 |
| Blacksmith's wages | 0 | 5 | 0 |
| | <hr/> | | |
| | £6 | 0 | 0 |

A plentiful and continual supply of water may be provided by converting kerosene tins into airtight reservoirs permitting the water to run out when the water-level in the trough soldered on at the base falls below the two small holes in the side of the tin.

The writer has seen as many as three portable fowlhouses in a large stubble field for several weeks after harvest. The fowls were feeding within a radius of 200 yards of their respective homes.

The method, if generally adopted, would greatly increase the output of eggs and poultry, besides minimising the cost of production in the colony, and eventually, we trust, secure some considerable part of the trade at present confined to Russia, France, and other egg-exporting countries.

The Orchard.

FRUIT CULTURE IN QUEENSLAND.

By ALBERT H. BENSON.

THE CHICKASAW PLUM.

THE attention of this department having been drawn to the uncertainty of obtaining a crop of the varieties of plums belonging to this family, especially the Wild Goose plum, the following information respecting their culture may be of interest to those who are growing this variety of fruit:—There are three species of wild plums, according to Downing, that are indigenous to North America, and of these the Chickasaw plum (*Prunus chicasa*, Michaux) has been cultivated and improved to a considerable extent, so that there are now many varieties of this wild American plum in cultivation of more or less value commercially. In addition to obtaining improved varieties, the Chickasaw plum has been crossed with the Japanese plum during the past few years by Mr. Luther Burbank, of Santa Rosa, California, and several crosses of considerable merit have been originated and distributed by him. Several varieties of Chickasaw plums have been introduced into Queensland by Mr. J. G. Cribb, of Milton, and Mr. L. G. Corrie, of Brisbane, as well as by a Sydney firm of nurserymen some five years ago, and one at least of Burbank's crosses, "The Juicy," has been introduced by a Queensland nurseryman. On the whole the trees have done well, and have made good growth. None of the family that I know of are robust growers, as they have all a more or less willowy, straggling growth, often very dense and thorny, and several of the varieties are apt to become dense bushes rather than trees. The crosses with strong growing Japanese plums, however, show a more vigorous growth, and it

is probable that the fruit of this type will be especially suitable to Queensland. This plum is propagated in several ways—viz., either from cuttings, suckers, or by budding or grafting on to selected stocks. The latter methods only should be chosen, as when the various varieties are grown on their own roots or from suckers they are usually very poor bearers and quite unprofitable, besides which, plants so raised are usually a perfect nuisance in the orchard or garden, on account of the numerous suckers that are thrown up from their roots, which, if let alone, as is sometimes seen in an abandoned or neglected orchard, form an impenetrable thicket, which rapidly spreads in area. This failure to bear, combined with its undesirable suckering propensities, has made growers chary of planting it, but these undesirable qualities may be to a great extent overcome by a proper system of propagation.

All the Chickasaw plums do best when either budded or grafted on a strong seedling peach stock, and as a rule, budding is preferable to grafting, as it is quicker and makes a more perfect union. They may also be worked on Japanese plums, but as stocks for raising young trees, I prefer the peach seedling. When there are undesirable varieties of Japanese plums or peaches which are useless on account of their liability to infestation by the fruit fly, I strongly advise their being worked over with one or other of the Chickasaw plums if plums for home consumption or local demand are wanted.

In selecting scions (buds or grafts) of Chickasaw plums, be careful to obtain same from strong healthy trees that have been proved bearers, and not from trees obtained by planting suckers, as by doing so you will in all probability produce good bearing trees.

As previously stated, the Chickasaw plums grow well in this colony and produce fruit under conditions of climate that are quite unsuitable to the growth of any varieties of European plums (*Prunus domestica*), and in addition to this their power of resisting the attack of the fruit fly renders them an especially valuable fruit for Queensland, particularly in the case of gardens and small orchards where the fruit is required for home consumption. The fruit, which is of a small to medium size, cannot be termed first-class as compared to any really good variety of *Prunus domestica*, though it may be useful in making jam, pies, &c., and as some of the varieties are the first plums to ripen, it has the further value of lengthening the plum season and of being marketable when there are no Southern plums to compete against it. Most of the varieties have a thin, tough skin which is usually red when fully ripe, and an orange pulp of a somewhat pleasant sub-acid flavour, becoming distinctly acid near the stone which is a tight cling. When unripe, the fruit is strongly astringent, and it is probably owing to this fact that it owes its immunity from the fruit fly, as though the fruit is frequently pierced by the fly, the eggs laid by it very seldom develop; in fact, I have only on one occasion seen the Wild Goose plum badly infected, and that was at Maryborough in 1896.

The Chickasaw plums can be gathered when quite unripe—in fact, as soon as fully grown and they show signs of turning yellow—they will then colour up properly. This is an advantage for marketing, especially if the fruit has to be sent any distance.

There are several varieties of Chickasaw plums now obtainable from Queensland nurserymen, of which the Wild Goose and Newman are now pretty widely distributed, but many of the other kinds are comparatively unknown.

Wild Goose.—Of medium size, early, bright purplish red colour, cling-stone; when worked on strong peach stock bears well. Have seen it bearing heavily at Toowoomba, Buderim Mountain, and several places on coast.

Newman.—Smaller than Wild Goose, and from one to two weeks later; light scarlet, clingstone. Not as good a grower as Wild Goose. When on peach a fair bearer.

Helm.—Small plum, very early, good bearer, but of a weak, straggling habit of growth. Forms a dense bush, and requires some pruning and thinning out to produce good fruit.

Lone Star.—Similar to Helm in shape and colour of fruit, also in growth, but later, often shy bearer when young.

Robinson.—Small fruit, heavy cropper, dark purplish red colour when fully ripe. Promises well.

Mariana.—Small fruit, usually poor bearer, dense bushy growth, weeping.

Weaver.—Small to medium fruit, dark red. A new variety, spoken well of in the United States.

Golden Beauty.—Small fruit, late. Said to be a good bearer.

Of the Cross Chickasaw and Japanese plums raised by Luther Burbank, the following are well spoken of:—

Juicy.—Botan. Japanese × Robinson, Chickasaw.

Gold.—Botan. Japanese × Robinson, Chickasaw.

America.—Botan. Japanese × Robinson, Chickasaw.

It will be noted that all three varieties have originated from the same cross. At the Government Experiment Orchards at Westbrook, and at the Hermitage on the Darling Downs, there are a number of varieties of Chickasaw plums planted for experimental purposes, the bulk of which are doing well, though they have not fruited yet.

KAINIT INJURIOUS TO STRAWBERRIES.

In their *Strawberry Manual*, Messrs. Laxton state that kainit, even in small quantities, is sometimes injurious to this fruit, the injury being probably attributable to the large proportion of common salt usually present. Muriate of potash also is said to have injured strawberries in some cases; but sulphate of potash is safe. Unless we are mistaken, however, the injury done to strawberries by these and other artificial manures arises from applying them so that a good deal of the dressing falls upon the foliage. We have known a mixture, chiefly consisting of superphosphate and bone manure, to kill the leaves of strawberries, when applied in the latter part of the winter or early in the spring. It is always best to apply artificials to this crop between the rows, and potash in any form or slag should be applied late in the autumn or in the winter, so that there is time for it to get to work before the growing season has steadily set in.—*Agriculture Gazette*.

On this subject, Mr. A. H. Benson writes:—Kainit or superphosphate applied broadcast to strawberry plants would burn the leaves more or less, especially if they were at all damp at the time of application. In this colony the growth of the strawberry is so rapid that it is always advisable to apply any manure that may be required by the plants to the soil before planting, so that it may be available at once. Top dressing is not so satisfactory.

FRUIT CULTURE IN QUEENSLAND.

By ALBERT H. BENSON

MANURING, No. 2.

THE COMPOSITION AND APPLICATION OF MANURES.

In the previous part of this article I have endeavoured to show the necessity for manuring, how plants feed, and what foods are required by them. I have endeavoured to show that plants require various foods in order to produce payable returns, and that the fertility of a soil is dependent on its containing these plant foods in an available form. I now come to the important question of the composition of the various manures, and the methods of applying them in order to obtain the best results from any particular fruit or farm crop to which they are applied.

The old definition of the term "manure" was a very comprehensive one, as it practically included every material the application of which to the soil would more or less increase its productiveness.

This has, however, been considered too vague, and the term "manure" is now commonly understood to refer to farm manure, or, as it is commonly called, farmyard manure, stable manure, dung or muck which consists of the solid and liquid excrements of the various farm stock, mixed with more or less straw or other absorbent matter, or to any other refuse matter, mulch, compost heap, &c., obtainable on the farm. All other manures are classed as commercial fertilisers, as in the majority of cases they are not produced by the farmer, but have to be purchased by him.

FARM MANURE.

As already stated, this manure is composed of the solid and liquid excrements of all kinds of farm stock, mixed with a greater or smaller proportion of absorbent matter. Such absorbent matter consists of straw, dried grass or weeds, ferns, cornstalks, &c., or often, in the case of animals kept in towns, of sawdust ashes, road scrapings, &c. It is a general or complete manure—that is to say, it contains all the essential elements of plant food in a more or less available form, though not always in the most desirable proportions for all plants. Farm manure is greatly neglected in this colony, and, even where conserved, it is usually so badly handled that the greater portion of its manurial value is either leached out or burnt out before it is applied to the land.

The composition of farm manure varies considerably, and depends largely on the kind and condition of stock producing it, the food they are getting, and the care given to the manure when produced.

Thus the excreta of young animals is always inferior to that of adults, as they extract more from their food. The excreta of cows and pregnant animals is also inferior in that they abstract more from their food to produce the milk or foetus respectively. The quality of the food always influences the value of the excreta; thus when stock are fed on foods rich in albuminous matter such as cow peas, beans, cotton-seed, &c., the excreta is rich in nitrogen. The excreta from well-fed animals is also superior to that of ill-fed animals or those in which the food ration is badly proportioned. The kind and amount of the absorbent material used also influence the value of the manure; so does the treatment that it receives before it is applied to the land. If thrown out in the open, and the sun, wind, and rain have free access to it, from one-half to two-thirds of its manurial value is rapidly extracted from it, but if kept covered and looked after the loss is only slight. It will thus be seen that it is an exceedingly difficult matter to determine the value of farm manure produced in this colony, especially as there is no analytical data to go on, and the values given by English, German, and American authorities are of little if any guide here, as the conditions under which the manure is produced are totally distinct. However, in the case of well-fed cows, pigs, or horses the manure, if well cared for, should be worth at least 5s. to 6s. per ton according to the Sydney standard of manurial values, though the best American authorities consider that 10s. is a fair average for well-made mixed farm manure. Besides its purely manurial value, farm manure has several valuable properties, and it is to this that it owes its especial value in this colony.

Farm manure contains a large proportion of organic matter which, when added to the soil, tends to improve its physical condition, making it easier to work and more friable. It also tends to increase the power of the soil to absorb and retain moisture—a most important consideration in a climate such as this, when dry spells are more or less frequent. It also tends to free unavailable plant food present in the soil and to retain nitrogen.

Most of our soils are deficient in organic matter and nitrogen; hence anything that will tend to improve them in this respect is of the greatest value to our cultivators. Before leaving the question of farm manure there is one other point to be considered, and that is the utilisation of waste farm products and converting same into compost heaps with or without the addition of lime or

commercial fertilisers. As a rule, these waste products are burnt or otherwise destroyed, and, in the case of orchards especially, their loss is a very serious one. All weeds, corn stalks, pumpkin vines, banana stalks, leaves, bush scrapings, and all so-called rubbish, which is usually burnt, should be gathered and placed into a heap together with the cleanings out of any ditches, drains, or road sides. The heap should be carefully built, and have sufficient soil mixed with it to keep it firm and cause it to rot properly, and should be covered by sheets of bark or iron, or by 6 inches or more of soil, to keep off heavy rains when once well wetted through. When partially rotten it should be turned over, and, if desirable, lime can be added, but lime will free the nitrogen present, and if there is not sufficient soil to absorb it as soon as it is freed it will be lost. If desired, phosphatic or potash fertilisers can also be added to the heap when turning, and this will greatly increase its manurial value. Such a compost heap should be made on every orange orchard, especially those that have been in bearing for some years, as it will be found to be the best and cheapest way of keeping up the fertility of the soil. The old orange-growers of Cumberland County, New South Wales, always considered a good top dressing of bush rakings and soil—which was practically a compost—the best possible application to the soil, and they often consider that the deterioration of many orchards is due to their inability of recent years to obtain the requisite amount of bush scraping needed for the top dressing of their trees.

There are other manure agents about the farm that are often neglected, such as the fowl manure and nightsoil, and both of these can either be mixed with the manure or compost heaps with beneficial results.

Farm manure, including compost heaps, can be applied to fruit trees either in the form of a mulch, or it may be spread over the ground and lightly ploughed or forked in. In the case of farm manure to be used as a mulch, the sooner it is used after it is made the better, as there is little if any loss once it is spread over the surface of the land. The disadvantage of fresh manure is that it is apt to produce an enormous crop of weeds, whereas, when properly made, the fermentation it has undergone has been sufficient to destroy all weed seeds contained in it. In the case of farm crops it is usually best applied by being spread broadcast over the land and then ploughed in, or if desired it may be placed in drills, and the plants, such as cabbages, potatoes, &c., planted on top of it; for this purpose, however, it is advisable that it be well rotted, as if too fresh it is apt to keep the soil too loose, especially if it is of a sandy nature, and thus cause the plants to dry out should a dry spell ensue. In heavy clay soils that are deficient in organic matter it is best to apply the manure fresh, as in this state it tends to keep the soil open, and thus render it more friable. No farmer or fruitgrower can afford to neglect farm manure, as is the common practice at present, as, no matter how rich the soil, continuous cropping is bound to deplete it of its available plant foods; and our heavy rains and high temperature rapidly exhaust the humus or organic matter in our best scrub soils, thus rendering them more difficult to work, less retentive of moisture, and deficient in nitrogen. I cannot emphasise too strongly the importance of conserving all farm manures, and I strongly recommend all fruitgrowers and farmers to make the most of all home resources of fertility before they spend their money on commercial fertilisers. Home manures should always form the basis of all manuring, and they should be supplemented, not superseded, by commercial fertilisers in order to maintain the soil in a high state of fertility.

COMMERCIAL FERTILISERS.

Under the heading of "commercial fertilisers" I include all manurial matter not produced on the farm. Such manurial matter may be either a natural manure such as blood, offal, bones, kainit, nitrate of soda, guano, coprolites, rock phosphates, &c., or it may be a by-product obtained during the manufacture of other materials, such as Thomas's phosphate, sulphate of ammonia, nippo, and other products of boiling-down and meat works.

Commercial fertilisers may be divided into two classes: complete fertilisers and special or incomplete fertilisers. The former contain all the principal plant foods such as nitrogen, phosphoric acid, and potash, in varying proportions, whereas the latter contain only one or sometimes two of these essential elements.

There are a large number of commercial fertilisers now on the market, a considerable proportion of which consist of the refuse of our meatworks and boiling-down establishments. These fertilisers consist mainly of blood, bones either fine or coarse, and dried refuse flesh. They vary considerably in their composition, owing to the source from which they are obtained, and are valuable on account of the nitrogen and phosphoric acid they contain, but as they contain practically no potash they rank as incomplete fertilisers.

A good average sample of a bone and blood fertiliser should contain from 6 to 7 per cent. of nitrogen, and from 12 to 14 per cent. of phosphoric acid, and be worth from £4 4s. to £5 per ton. The nitrogen is available, and is valued at 10s. per unit—that is to say, each per cent. of nitrogen present in the fertiliser is worth 10s. per ton. The phosphoric acid is insoluble, and is only worth 2s. per unit, and the rapidity with which it becomes available for plant food depends on the fineness to which it has been ground: thus, fine bonemeal is rapidly acted upon by the carbonic acid in the soil, and rendered soluble and available for plant food, whereas coarse bones only become available slowly, and their action lasts over a considerable time. When quick results are required the manure should be ground as finely as possible; but for crops such as fruit trees, which occupy the soil for many years, it is advisable to have a proportion of coarse material mixed with the fine, so that the action of the fertiliser may be more lasting. The proportion of nitrogen and phosphoric acid in such manures varies considerably, and is dependent on the amount of dried blood, bone matter, or dried flesh present. When there is a large proportion of dried blood or flesh, then the nitrogen is high; but when there is a greater proportion of bone matter, then the nitrogen is lower and the phosphoric acid higher.

Instead of mixing the blood, bones, &c., together, they are sometimes kept separate and sold as either bonedust or blood-manure.

A good sample of bonedust should contain from 50 to 55 per cent. of bone phosphate, equal to 23 to 25 per cent. in round figures of insoluble phosphoric acid, and about 3 per cent. of nitrogen, and be worth from £4 to £4 5s. per ton.

A good sample of dried blood should contain 12½ per cent. of nitrogen, and be worth £6 5s. per ton; and of nippo, 12 per cent. of nitrogen, worth £6 per ton.

Bonedust is most advantageously applied in conjunction with other manures, such as superphosphate, sulphate of ammonia, or sulphate of potash, but if it is used alone it should be applied to the land some time before it is required; otherwise it will not be available on account of its insolubility, but will tell more on the succeeding crops than to that to which it is applied. Blood and nippo, on the other hand, are in a readily available condition, and the crop to which they are applied derives a quick benefit therefrom. They can, therefore, either be applied at the time of planting the crop or can be used as a top dressing by being applied broadcast, and either harrowed, cultivated, or chipped in according to the nature of the crop to which they are applied. Neither blood nor nippo are complete fertilisers, as their manurial value depends entirely on the nitrogen they contain, and, before they can be made complete, must have phosphoric acid and potash added.

A second class of commercial fertilisers are those special fertilisers containing only one element of plant food, usually either nitrogen or potash—such as sulphate of ammonia, nitrate of soda, sulphate of potash, muriate of potash, and kainit.

Sulphate of Ammonia.—A good sample should contain at least 20½ per cent. of nitrogen, and be worth in round figures £10 per ton. This manure is very soluble, and consequently acts with great rapidity. It is used either as a top dressing by itself or is mixed with varying proportions of phosphoric acid and potash to form a complete fertiliser. When used alone it

should be applied at the rate of 1 to 2 cwt. to the acre during a period of the plant's active growth. It has a marked effect on the growth of cereals, grasses, corn, sorghum, &c.; but is apt to produce too much straw or stalk at the expense of the grain. It is therefore most valuable for the growth of green fodder or hay, but not so valuable for grain production. It is of great value in the production of vegetables when rapid growth and quick returns are desirable, but in this case it is better to use it in conjunction with soluble phosphoric acid and potash in order to produce the best results. Used by itself, it is very apt to impoverish the land, as it stimulates such a vigorous growth that the plants are apt to exhaust the soil of other available plant foods. Its use, therefore, requires judgment, followed by judicious cropping, cultivation, and the application of farm manure or a complete fertiliser.

In the case of fruit trees that have been neglected and run down, a severe pruning, followed by a good dressing of sulphate of ammonia—say, 2 to 4 lb. to the tree, according to its size—will often produce a vigorous growth, provided that the roots are healthy, but care must be taken, once this growth has been forced, that the trees have a sufficiency of plant food given them in the form of farm manure or a complete fertiliser to sustain and continue such growth.

Nitrate of Soda is similar in its action to sulphate of ammonia, but at its present price, as compared with other sources of nitrogen, it is too dear to use. It contains a little over 15 per cent. of nitrogen, worth about £7 5s. per ton, and its cost is about £15 per ton.

Sulphate of Potash.—This fertiliser is seldom used alone—in fact, its use is only to be recommended when combined with nitrogenous and phosphatic fertilisers. A good sample should contain at least 50 per cent. of potash, and is worth 5s. 4d. per unit, or about £13 10s. per ton. It is probably the best form of potash to use, as the general opinion is that the best results are obtained from its use.

Muriate of Potash.—Similar in its action to sulphate of potash, and used in place of the latter. A good sample contains about 60 per cent. of potash, and is worth about £15 per ton, as the potash is considered to be less readily available, and consequently of slightly less value, when in the form of muriate than in the form of sulphate.

Kainit.—A mixture of muriate of potash, muriate of soda (common salt), and muriate of magnesia. Its value is due to the potash it contains, which in a good sample amounts to 13 per cent., worth £3 9s. per ton, whereas the price charged is not less than £4 per ton. Kainit is therefore a dear form of potash as compared with the sulphate or muriate, as not only does the potash cost more per unit but the proportion is so small that a much larger amount—from four to five times—is required to produce the same result. This adds considerably to the freight and handling, and consequently renders this form of potash expensive to use.

There is one other form of potash now on the market known as "Australian potash," which contains 25 per cent. of potash and $4\frac{1}{2}$ per cent. of insoluble phosphoric acid, which is worth about £7 per ton when estimated at its unit values. Its price is £6 per ton in Sydney, at which rate it is the cheapest form of potash on the market.

There are two other classes of commercial fertilisers—of which the first is superphosphate, and the other a complete or mixed fertiliser.

Superphosphate.—The manufacture and value of super or soluble phosphate was referred to in the previous part of this article, so I will only need to give its unit value, which is 5s. 4d. per unit for water soluble phosphoric acid, 4s. 6d. for citrate soluble phosphoric acid, and 2s. for insoluble. A good superphosphate contains about 17 per cent. of soluble phosphoric acid.

Complete or Mixed Fertilisers.—There are a number of manures of this type on the market, the composition and value of which are very variable, as they are made with a view of meeting the requirements of various soils and crops, both farm, garden, and orchard.

The bulk of these manures consist of a mixture of phosphatic, nitrogenous, and potash manures. The phosphatic portion is present either in the soluble or superphosphate condition or else in that of the insoluble or bone phosphate condition.

The nitrogen is present either in the form of sulphate of ammonia, or in that of blood, nippo, or other form of organic nitrogen—usually the former; and the potash is almost always present in the form of sulphate of potash. The so-called Colonial Sugar Company's manures are good examples of this type, and their composition can be relied upon, but there are others on the market equally as good.

In dealing with the question of complete or mixed fertilisers, I wish it to be clearly understood that the suggested composition of and quantity to be applied to any particular crop is not to be taken as absolutely binding on all classes of soils and under all sorts of conditions of cropping and cultivation, but to refer to land of medium quality, well worked, in good condition, and preferably under a systematic rotation of crops. In the matter of manuring it is impossible to lay down any hard-and-fast rules, as, though we know that a certain crop will take so many pounds of nitrogen, phosphoric acid, and potash out of the soil, the mere fact of our adding this quantity of plant food to the soil will not be sufficient to secure such crop. The state of the land, heat, moisture, and many other factors have to be taken into consideration; but, at the same time, the knowledge of the essential plant foods required by individual crops, and the practical application of this knowledge, combined with sound common sense and judgment, will be found to be of great value. In the case of the application of commercial fertilisers, the agriculturist will learn as much, if not more, by careful observation of the habits of growth of various plants, and of the action of the various manures on same in his particular soil, and under the particular conditions of climate in which he is working, than he will from all the chemist can tell him of the analysis of his soil or of the plant foods extracted from it by various crops. The best results are obtained by a judicious combination of both the scientific knowledge of the chemist and the practical observation and knowledge of the agriculturist.

Composition of Mixed Fertilisers.—In estimating the value of commercial fertilisers I have taken the standard adopted by the New South Wales Department of Agriculture, viz.:—

- 5s. 4d. per unit for water soluble phosphoric acid.
- 4s. 6d. per unit for citrate soluble phosphoric acid.
- 2s. per unit for insoluble phosphoric acid.
- 5s. 4d. per unit for potash.
- 10s. per unit for nitrogen in blood, nippo, offal, &c.
- 9s. 6d. per unit for sulphate of ammonia.

In the different mixtures recommended the individual fertilisers are assumed to be of the following composition, a high standard having been chosen:—

Sulphate of ammonia, containing $20\frac{1}{2}$ per cent. of nitrogen, worth £10 per ton.

Nippo, containing 12 per cent. of nitrogen, worth £6 per ton.

Dried blood, containing $12\frac{1}{2}$ per cent. of nitrogen, worth £6 5s. per ton.

Superphosphate, containing 17 per cent. of water soluble phosphoric acid, worth £4 5s. per ton.

Bone phosphate, containing $27\frac{1}{2}$ per cent. of insoluble phosphoric acid, worth £2 15s. per ton.

Meatworks manure, containing $6\frac{1}{2}$ per cent. of nitrogen and 14 per cent. of insoluble phosphoric acid, worth £4 13s. per ton.

Sulphate of potash, containing 50 per cent. of potash, worth £13 10s. per ton.

Buyers should always insist on knowing the analysis of any fertiliser that they purchase, and not only that, but they should insist on the seller giving them a guarantee that the fertiliser as sold is up to such analysis. Given this, it is an easy matter to compare the value of any particular fertiliser with those given above.

FOR CITRUS TREES.

Citrus fruits remove a considerable amount of plant food from the soil, as will be seen by referring to the table at the end. They require large quantities of nitrogen and potash, but only a comparatively small proportion of phosphoric acid. It is not advisable to give the trees too soluble a manure, or to apply it in too large quantities, but the fertilisers should contain plant food in both a soluble and slowly available form. The following proportions will be found to suit many orchards:—

| | | | |
|------------------------------------|--------|------|----|
| Meatworks manure, blood, and bones | ... | Cwt. | 10 |
| Superphosphate | | | 4 |
| Sulphate of potash | | | 4 |
| Sulphate of ammonia... | | | 2 |
| | | | — |
| | | | 20 |

This fertiliser will contain about 5½ per cent. of nitrogen, 10 per cent. of potash, 10½ per cent. of phosphoric acid, of which 3½ per cent. is water soluble, and be worth £7 per ton. Manuring is seldom required in young citrus orchards in this colony, provided they are planted in suitable soil; but if the land is poor, then from 4 to 6 lb. per tree for trees up to five years of age, applied in two lots, will be sufficient, but for trees in bearing the amount should range from 10 to 20 lb. per tree according to size, applied in two lots. In making the above manure, blood or nippo may be substituted for the sulphate of ammonia, but it will be apt to render the fruit more acid and somewhat thicken the skin. The best way to apply this manure is to broadcast it round the tree and to either chip, harrow, or cultivate it in; spread the manure round the feeding roots of the trees, not right round the stem. Apply in July or August, and again in January. Experience may prove that in the case of rich scrub soil of volcanic or some soils of granitic origin it is not necessary to use so much potash, in which case it may be reduced, and the nitrogen and phosphoric acid increased.

In the case of sandy soils it may also be advisable to increase the proportion of potash, but this can only be determined by the orchardist carefully noting the result of the manuring.

FOR BANANAS.

All banana-growers know that this fruit thrives best in rich scrub land that is rich in humus and nitrogen; hence any manure that is applied should contain these elements. Farm manure is especially adapted for this crop on account of the large quantity of organic matter it contains, and when it can be obtained in quantity it is the best manurial agent that can be applied. If followed by commercial fertilisers, its beneficial effects are considerably increased. The banana is a strong quick-growing plant; hence it is necessary that the plant food supplied to it shall be such that it is in a readily available condition. This necessitates the use of quick-acting fertilisers, but they should be combined with a proportion of slower acting ones, so that the effects may be more lasting.

Where bananas are planted in old land it is advisable to apply the fertiliser at the time of planting, mixing it thoroughly with the soil that is placed in the hole that is dug for the plant, so that the young plant will have a sufficiency of plant food from the start, and therefore make a rapid growth. Subsequent manurings should be applied broadcast round the plants or, in the case of old plantations, over the whole of the ground, so as not to confine the roots to one particular spot, and then chipped, harrowed, or cultivated in. The best time to apply such fertiliser is in early spring before the summer growth starts, as it will then be available for use when growth takes place.

Mix as follows:—

| | | | | | |
|--------------------|-----|-----|-----|-----|------|
| Superphosphate | ... | ... | ... | ... | Cwt. |
| Meatworks manure | ... | ... | ... | ... | 6 |
| Nipho | ... | ... | ... | ... | 6 |
| Sulphate of potash | ... | ... | ... | ... | 2 |
| | | | | | — |
| | | | | | 20 |

This will contain— $5\frac{1}{2}$ per cent. of nitrogen, 5 per cent. of potash, $9\frac{1}{2}$ per cent. of phosphoric acid, of which 5 per cent. is water soluble, and be worth £5 16s. per ton.

The first application to the young plants when planting should be at the rate of 4 lb. per plant, and subsequent manurings should not be less than $10\frac{1}{2}$ cwt. per acre.

If wished, 2 cwt. of the nipho can be replaced by 2 cwt. of sulphate of ammonia. This will increase the percentage of nitrogen by .8 per cent., and the cost by 9s. per ton.

FOR PINES.

For pines no manure is equal to good farm manure, or well prepared compost. If the farm manure used contains a considerable proportion of sawdust, as is often the case when it is obtained from town livery or 'bus stables, it should be allowed to become thoroughly fermented before it is applied, as this will tend to remove any deleterious properties of the sawdust. Where a commercial fertiliser is required, the plant food contained therein should be in a readily available form; and this has been especially noticeable at Redland Bay Experiment Orchard, where the application of superphosphate and sulphate of ammonia—particularly the latter—has produced very rapid and marked results. Where the land is impoverished it is advisable to apply the manure previous to setting out the plants, which will then make a good start, but in rich land this is not necessary. The best way to apply the manure in this case is to take out a trench with the plough where the line of plants is to be planted; spread the manure in this trench and thoroughly mix it with the soil by running a Planet Jr. cultivator with only two narrow teeth up and down the trench, the plants being then set and the earth drawn round them. If commercial fertilisers are applied without being thoroughly mixed with the soil in this or similar manner, they are apt to burn the young plants should dry weather follow the planting. In any case, unless well mixed there will be more likelihood of loss, and the plants are not so well able to obtain it as it is in one spot instead of being evenly distributed.

In applying commercial fertilisers to older plants, especially when same are grown into a thick mass, I strongly advise their being composted as previously described instead of being applied direct, as this will supply both plant food and humus as well as cover for the surface roots, which is apt to be washed off by heavy rains.

The fertiliser should be made as follows:—

| | | | | | |
|---------------------|-----|-----|-----|-----|-----|
| Superphosphate | ... | ... | ... | ... | Cwt |
| Meatworks manure | ... | ... | ... | ... | 9 |
| Sulphate of ammonia | ... | ... | ... | ... | 5 |
| Sulphate of potash | ... | ... | ... | ... | 4 |
| | | | | | 2 |
| | | | | | — |
| | | | | | 20 |

This will contain $5\frac{1}{2}$ per cent. of nitrogen, 5 per cent. of potash, 11 per cent. of phosphoric acid, of which $7\frac{1}{2}$ per cent. is water soluble, and is worth £6 12s. per ton.

Proportionate amounts of dried blood or nipho can be used in the place of the sulphate of ammonia, the proportion of superphosphate being reduced accordingly. This will reduce the price of the manure, but at the same time reduce the proportion of soluble phosphoric acid. For pines in full bearing at

least half a ton to the acre should be applied if no farm manure is used; less in proportion to the quantity of farm manure applied.

FOR STONE FRUITS.

Use a similar manure to that recommended for citrus, but reduce the nitrogen and increase the phosphoric acid and potash.

FOR STRAWBERRIES.

As the strawberry is a quick growing crop in this colony, and, as a rule, the plants only occupy the ground a few months, quick-acting fertilisers are essential. Well rotted farm manure dug into the ground some time previous to planting is an excellent preparation for the crop, but when the soil is at all poor the following fertiliser should be placed in shallow furrows and well mixed with the soil as previously described in the case of pines, the plants set out and the soil drawn round them. The composition of the fertiliser is as follows:—

| | Cwt. |
|---------------------------|------|
| Superphosphate | 10 |
| Sulphate of ammonia... .. | 5 |
| Sulphate of potash | 5 |
| | — |
| | 20 |

This will contain 5 per cent. of nitrogen, $12\frac{1}{2}$ per cent. of potash, $8\frac{1}{2}$ per cent. of phosphoric acid, all water soluble; and is worth £8 2s. 6d. per ton.

From 4 to 6 cwt. to the acre, according to the richness of the soil, is a sufficient dressing. This manure will also suit Cape gooseberries and tomatoes.

FOR VEGETABLES OTHER THAN PULSES.

In order to produce good vegetables they must be grown quickly, thus the application of quick-acting manures is required. This will be obtained by the following mixture:—

| | Cwt. |
|----------------------------|------|
| Superphosphate | 14 |
| Sulphate of ammonia | 5 |
| Potash | 1 |
| | — |
| | 20 |

This will contain 5 per cent. of nitrogen, $2\frac{1}{2}$ per cent. of potash, 12 per cent. of phosphoric acid—all water soluble, and is worth £6 5s. 6d. per ton.

Apply from 4 to 6 cwt. to the acre. Instead of using all superphosphate, half bone phosphate and half superphosphate can be used. This will reduce the price 7s. 6d. per ton, and will render the manure more lasting.

In applying commercial fertilisers to vegetables, it is best to mix them thoroughly with the soil before planting, but, if wished, they can be used as a top dressing, taking care to distribute them evenly, and not to allow them to cover the leaves of the plants, as if so they will be very apt to scorch or burn them.

FOR OATS, BARLEY, CORN, OR SORGHUM, WHEN USED FOR FODDER.

A quick-acting manure is required, which should be applied at the same time that the seed is sown, and harrowed in in the case of broadcast crops. If the corn or sorghum is sown in drills, the manure should be applied as recommended in the case of planting pines. It can be made as follows:—

| | Cwt. |
|----------------------------|------|
| Superphosphate... .. | 10 |
| Bone phosphate | 5 |
| Sulphate of ammonia | 4 |
| Sulphate of potash | 1 |
| | — |
| | 20 |

This will contain 4 per cent. of nitrogen, $2\frac{1}{2}$ per cent. of potash, $15\frac{1}{2}$ per cent. of phosphoric acid, of which $8\frac{1}{2}$ per cent. is water soluble, and is worth £5 14s. 3d. per ton. Apply from 4 to 5 cwt. to the acre.

FOR BEANS, PEAS, COW PEAS, AND OTHER PULSES.

No nitrogen is required by these plants unless the soil is absolutely deficient in this plant food, and then it is advisable to give a little to start the plants till they are sufficiently strong to provide their own nitrogen. These plants require a considerable proportion of potash, so that in all soils that are deficient in this respect, a fertiliser rich in potash must be used. For an average soil the following will be found to answer:

| | cwt. |
|-----------------------|----------|
| Bone phosphate... | 10 |
| Superphosphate... | 6 |
| Sulphate of potash... | 4 |
| | <hr/> 20 |

This will contain 8 per cent of potash, 16½ per cent of phosphoric acid, of which 5 per cent. is water soluble, and is worth £5 12s. per ton.

From 5 to 6 cwt. to the acre, mixed thoroughly with the soil before planting, should be a fair dressing in soils of average quality.

The following table, which has been obtained from a number of European and American sources, gives the total amount of ash removed from the soil by 1,000 lb. of the following fruit—farm and garden crops, as well as the composition of the ash, showing the relative proportions of phosphoric acid, potash, and nitrogen. In the case of the nitrogen, the amounts given represent not only that contained in the ash, but also that contained in the albuminous matter of the fruit or plant.

As previously stated, the mere fact that a given crop takes so much out of any given soil cannot be considered accurate under all conditions, but is at the best only an approximation. At the same time, it is of value, as indicating the particular plant foods which are required by different crops; and when this knowledge is combined with the experience gained by the practical application of manures and commercial fertilisers, it will be found to be of great assistance to all agriculturists.

| | Total Ash. | Nitrogen. | Phosphoric Acid. | Potash. |
|--------------------|------------|-----------|------------------|---------|
| | lb. | lb. | lb. | lb. |
| FRUITS— | | | | |
| Apple ... | 3.9 | 1.3 | .1 | 1.9 |
| Apricot ... | 5.2 | 2.29 | .71 | 2.2 |
| *Banana ... | 11.5 | .8 | | |
| Pine ... | 3.5 | .2 | .15 | 1.7 |
| Grape ... | 5 | 1.6 | .9 | 2.7 |
| Orange ... | 4.3 | 1.9 | .5 | 2.1 |
| Lemon ... | 5.6 | 1.5 | .6 | 2.7 |
| Olive ... | 14.2 | 1.8 | 1.2 | 8.5 |
| *Peach ... | 3.2 | | .5 | 2.4 |
| Plum ... | 5.4 | 1.8 | .2 | 2.4 |
| Cherry ... | 5.8 | 1.8 | .6 | 2 |
| Strawberry ... | 6 | 1.5 | 1.1 | 3 |
| FARM CROPS— | | | | |
| Wheat, Grain ... | 17.8 | 18.2 | 3.7 | 5.5 |
| Wheat, Straw ... | 38.1 | 5.9 | 1.2 | 5.1 |
| Barley, Grain... | 24.8 | 15.1 | 7.9 | 4.8 |
| Barley, Straw... | 45.9 | 6.4 | 1.9 | 10.7 |
| Maize, Grain ... | 14.8 | 16 | 5.7 | 3.7 |
| Oats, Grain ... | 26.7 | 17.6 | 6.8 | 4.8 |
| Oats, Hay ... | 61.1 | 11.9 | 6.7 | 25.4 |
| Lucerne Hay ... | 62 | 23 | 5.3 | 14.6 |
| Beans, Grain ... | 31 | 40.8 | 12.1 | 12.9 |
| Potatoes ... | 9.9 | 2.1 | .7 | 2.9 |
| Sweet Potatoes ... | 9.5 | 2.3 | 1 | 5 |
| Mangold* ... | 12.2 | 1.9 | .9 | 3.8 |
| Pumpkins ... | 6.3 | 1.1 | 1.6 | .9 |
| VEGETABLES— | | | | |
| Cabbage ... | 14 | 3.8 | 1.1 | 4.3 |
| Cauliflower ... | 8 | 4 | 1.6 | 3.6 |
| Carrot ... | 10.2 | 1.6 | .9 | 5.1 |
| Celery ... | 17.6 | 2.4 | 2.2 | 7.6 |
| Onion ... | 7.4 | 2.7 | 1.3 | 2.5 |
| Peas ... | 31.1 | 35.8 | 8.4 | 10.1 |
| Tomatoes ... | 4.7 | 1.6 | .5 | 2.7 |

* Complete analysis not given.

NOTES ON OLIVE CULTIVATION.

By ALBERT H. BENSON.

THE attention of this Department having been called to the article on "Olive Cultivation" that appeared in the October number of this *Journal*, and one of the methods of propagation described therein having been severely criticised, I have been requested to reply to the criticism.

The writer of the article, quoting from Mr. Lewis A. Bernays, advises the planting of cuttings and truncheons in an upright position when the tree is to occupy the position permanently, and gives as his reason for so doing that a year is saved thereby, and that you commence with a good stem to form the trunk of the future tree. This method of propagation is taken exception to, and is stated to have proved unsuccessful when tried in Australia. I quite agree with the writer of the criticism that this method, as described, is not adapted to this colony, as cuttings or truncheons so planted would be apt to dry out, especially if any considerable portion of same were allowed to remain above ground. On the other hand, I may state that I have raised trees successfully, both in these colonies and in California, by this method of propagation, with this exception—that instead of planting the truncheon upright, it has been set at an angle of about 30 degrees, and no portion has been allowed to remain above the ground, the top of the truncheon being from 2 to 3 inches below the surface of the ground. I do not, however, recommend this method of propagation, except in cases where it is desirable to plant the truncheon in the position the tree resulting from it is to occupy permanently, as it is more uncertain and more wasteful of material than planting the truncheons in a trench horizontally and covering them completely to a depth of 4 or 5 inches. When so planted, several plants may be obtained from the same truncheon, whereas when planted upright, or at an angle of 30 degrees, only one shoot is allowed to develop to form the future trunk of the tree. If carefully transplanted there is only a slight check to the plants on their removal from the nursery to their permanent position, and as far as my experience goes, truncheons planted upright do not gain a year over those that are grown horizontally in nursery and then transplanted. This latter method has been adopted by me at the Westbrook Experiment Farm, and has answered well, the truncheons often producing four or more vigorous and well developed plants, such plants being trained to a single stem and headed at about 2 feet from the ground, so that they are well grown and evenly balanced trees when set out permanently. The growing of seedlings is not to be recommended except for the purpose of producing stocks on which to propagate selected varieties, and the scions (buds or grafts) used for this purpose should be obtained from bearing trees, not from young plants as advised. There is one method of propagation largely used in California that is not described—viz., the propagation by means of small cuttings of the season's growth—viz., the tips of the branches. The wood requires to be well ripened, but not quite hard, and the cutting is prepared by making a square cut just below a pair of leaves about 3 inches from the end of the branch. The leaves are usually cut off, only leaving the top pair of leaves, and the cutting is planted in sand to a depth of 2 inches in a similar manner to that employed in the propagation of many flowering plants. The young cuttings must be kept moist, but at the same time must have perfect drainage and, if necessary, bottom heat, as they will not strike if the ground is at all wet or cold. This method of propagation produces well-rooted plants, which, when large enough, are planted out in nursery rows and thence transferred to their permanent positions when required. The olive does remarkably well on the Darling Downs, and will thrive on the stony ridges which are unsuitable for cultivation; but it is a mistake to think that the olive will thrive in any soil, no matter how dry or poor. It will no doubt grow where other trees would starve, but in order to produce profitable crops of fruit the tree requires careful attention and a soil that is moderately rich in lime, phosphoric acid, and potash, as without a

sufficiency of plant food it will fail to bear fruit. There is one use to which I consider the olive can be put that has been overlooked by the writer of the article, and that is its being grown as a shelter tree, an especially valuable consideration for many of the exposed parts of the Downs. Belts of olives planted as windbreaks would, therefore, answer the purpose for which they are planted, and, at the same time, the crop of fruit they produce would pay for the land they occupy and the care and attention devoted to their culture.

Viticulture.

THE EFFECTS OF THE LATE FROST ON VINES.

By E. H. RAINFORD,
Viticultural Expert.

THE great frost of 2nd October and following days affected all varieties of vines almost to the coast; and from Toowoomba, south and west, so severe were the effects, especially in low-lying ground, that at first it appeared as though the entire crop had been lost. Here and there an isolated vineyard on high ground had escaped, but in the majority of cases the vines presented an appearance as though a bush fire had been through them.

Happily, later accounts are more reassuring, and although the damage is great, a certain amount of fruit will be harvested if no further meteorological troubles intervene. This is to be accounted for by several varieties of vines putting out a second crop with the new vegetation—a fact that should be a matter of satisfaction to Queensland vignerons, as it shows a vigour and recuperative power of vines in this colony that cannot be approached anywhere in Europe. It may be taken as a positive fact that had such a frost affected European vines at the same stage of vegetation, no crops would have been borne on the second growth, or, at most by the most careful disbudding a few odd bunches might have been fostered. Certain varieties of vines seem to have rather gained by the frost, as the second crop is decidedly larger than the first. At the Westbrook State Farm, the Muscats of Alexandria have a much finer second crop. The black Muscats have also done well where last year's wood was not killed. The black Clusters and Clairettes (so-called Verdeilhos) have borne a second crop nearly equal to the first; the Hermitage about half a crop. At the Hermitage State Farm, the Muscats of Alexandria and Clairettes have produced a second crop larger than the first; but other varieties have little fruit. In the Warwick district, a large vineyard, soon after the frost, appeared to be totally destroyed, the crop being estimated at 1 cwt. or 2 cwt. The second crop will scale several tons if all goes well. Here the best results were obtained from the Clairettes and Black Spanish, with an almost full crop. Hermitage came next, with a scarce half-crop. Turning to the Roma district, information to hand shows that the Muscats will have a fine second crop, and others, such as Sweetwaters and Verdeilhos, will have from a small to half a crop. On this point, any information sent to this Department will be very acceptable, as a record of the varieties of vines which gave good second crops will be valuable for future reference.

The vines which appear to be most reproductive after a severe frost are the Muscat of Alexandria, the Canon Hall and Muscat Hamburg, the Black Spanish, the Clairette (known as Verdeilho on the Downs), the Black Cluster,

and Hermitage. Those intending to plant vines in districts subject to late frosts would do well to bear this in mind, as, by planting these varieties amongst other, the loss by frost will be lessened.

It is a pity that in a country like Queensland, where brushwood is so easily obtained, vignerons do not make some preparations for possible late frosts, as is done in Europe. From the time the vines start in the spring, until all fear of frost is over, a few heaps of rubbish and brushwood placed round the vineyard are all that is required. When a very cold night threatens a frost, these are lighted in the early morning, and the smoke arising will prevent any possibility of frost-bitten shoots. It means getting up at 3 or 4 a.m., and there's the rub! but the preservation of the crop is certainly worth that inconvenience. A little courage and an alarm are all that are wanted.

Apiculture.

HONEY AND BEESWAX IN VICTORIA.

FROM official returns of the number of beekeepers, and the quantity (so far as returned) of honey and beeswax produced in Victoria during the season 1898-99, and also of the quantity produced for 1897-98, we learn that the beekeepers number 3,095, with 19,140 hives, producing 881,221 lb. of honey and 22,213 lb. of beeswax. In the previous season the apiculturists numbered 1,857, owning 14,225 hives, which produced 195,163 lb. of honey and 7,782 lb. of wax. This shows a remarkable extension of the industry, the increase of honey production being no less than 686,058 lb., and of wax 11,431 lb. Of the 1898-99 total, 16,334 hives were returned as producing honey.

PUTTING UP HONEY.

A BEEMAN writes as follows in the *Farmer and Stockbreeder* :—

Honey, to attract buyers, must be in some kind of attractive case, clean, and, if bottled, of nice colour. The cost of bottles adds considerably to the 1 lb. of honey put up in it. I was, therefore, very pleased the other day to see two decided novelties in bottles. The first was that the screw caps fitted, and the second that there are bottles sold, of English manufacture, that have well-fitting screw caps. But they are remarkably cheap, ten dozen costing 12s 9d. The former are satisfactory from the fact that, though they are at the ordinary rate of 20s. per gross, each bottle, after being fitted with screw cap, is wrapped in paper. A friend, who had probably something to do with this action on the part of the dealer, told me that the firm sold him bottles and caps, but the latter had to be changed three times before properly-fitting covers were received. The caps are usually too soft, and lose the screw when tightly fitted on. If the cheaper kind of bottle is used, it will not form an attractive feature of the display; consequently there must be a special sample in a show bottle, and a guarantee that the other bottles, not showing it off so well, contain the same quality honey.

HONEY TINS.

Honey must not touch zinc. A few weeks ago I put some in a zinc pail, intending it to stand only a short time—in fact, while some had run through the strainer of the honey cistern—but it ran so slowly that the honey had to remain in the pail till the next day. I tasted it before emptying, and the result was such as to determine me never to use zinc again.

Tins for permanent storage, and also for small quantities, may be used. For the latter purpose the lever-opening tins are much favoured. The honey is kept secure in them, and the lids are removed by the aid of a coin quite easily.

Similar cans may also be used for larger quantities; but four holding 28 lb. each are, to my mind, much more convenient than two holding 56 lb. each, or even one holding 112 lb. The smaller sizes are more portable, and liquefying is quicker with small than large lots.

Horticulture

THE *GLADIOLUS*.

By G. WATKINS.

(Read before the Horticultural Society of Queensland, 14th November, 1899.)
HAvING promised to prepare a paper for reading at one of the meetings of this society, I thought this beautiful and greatly admired flower would prove a good subject especially to read when the flower was in bloom, as now, and when a good collection of cut blooms could be gathered together for illustration. The exhibits now on the table before you, grown by members of this society, are, I think, an ample justification for my choice of subject.

The *Gladiolus* (or Corn Flag) belongs botanically to the Iris family, and has for close family connections the *Ixia*, *Sparaxis*, *Watsonia*, *Tribonia*, *Crocus*, *Tigridia*, &c.

The name is derived from the Latin, little sword, in allusion to the shape of the leaf. Gladiator is a word of kindred derivation.

The genus comprises about 130 species of perennial herbs, with corms and linear or sword-shaped leaves. The flowers are borne on a two-rowed spike, more or less distinctly marked, and consist of a six-parted perianth, with short curved tube and oval unequal segments. The three stamens, frequently highly coloured, and adding to the beauty of the flower, are inserted on the perianth tube. The ovary is egg-shaped, the style long and thread-like, with three stigmas. The perianth tube is well stocked with nectar, and much visited by bees. The capsule is leathery, three-celled, containing many seeds more or less winged.

Fifteen species are natives of Europe and Western Asia, the others being natives of the Cape and tropical Africa. Southern Africa—comprising Cape Colony, Natal, &c.—is the great home of the *Gladiolus* and its kindred tribes, and just now the hillsides and veldts are clothed with spring verdure; and the native forms of *Gladioli* and their allies, so well known under the general term of "Cape Bulbs," should be in full flower.

The corms of several varieties furnish part of the food of the baboons, and those of *G. eudalis* are roasted and eaten by the natives of interior South Africa; but, as a rule, though containing much starch, the juices are too acrid to permit of the corms being used for food.

Three hundred years ago only the European species, *G. communis*, a native of the south of France, and a closely allied species, *G. segetum*, a native of Southern Europe, were the only ones known to civilisation, but they were seldom cultivated in gardens. *G. byzantinus* was introduced from Turkey in 1629, but the chief introductions were made from the Cape about the middle of the last century.

About 30 species, and as many varieties, are listed by Miller in his dictionary of plants, 1757.

The more important species, such as have been cultivated and used for hybridising purposes, are:—*G. tristis*, introduced in 1745; *G. recurvus*, in 1758; *G. villatus*, in 1760; *G. blandus*, in 1774; *G. floribundus*, in 1788; *G. cardinalis*, in 1789; *G. grandis*, *G. viperatus*, and *G. versicolor*, in 1794; *G. alatus* and *G. cuspidatus*, in 1795; *G. papilio*, in 1866; *G. cruentus*, in 1868; *G. purpurea-auratus*, in 1872; and *G. brachyandrus*, in 1879—the latter from Central Africa.

Other late introductions have been *G. quartinianus*, a yellow variety from Abyssinia; *G. Kotochyanus*, a bright lilac purple from Afghanistan; and *G. Watsonioides*, from Eastern Africa.

The species *G. Saundersi*, *dracocephalus*, and *Cooperi* were sent to Mr. Saunders about 1865 from South Africa by his collector, Mr. Cooper. The former is one of the most remarkable of the species, and has flowers of intense scarlet with spotted white throat and of the largest size; it has been extremely useful in the hands of the hybridiser.

G. ramosus, the branching *Gladiolus* was introduced from Holland about 1836, but there is a doubt whether it is a species or hybrid.

A few of the native species have considerable beauty; but the greater number are comparatively insignificant in size, form, and the colour of the flower. They are seldom to be met with in gardens, excepting those of a strictly botanical character. However, it is from them, and chiefly from those enumerated, that the garden varieties of to-day have been produced by cross-fertilisation in the hands of skilled Belgian, Dutch, French, and English hybridists.

G. cardinalis, the Scarlet *Gladiolus*, considered in itself a hybrid by some authorities, has been the great foundation species in this direction. It is recorded as being first flowered in a Kensington nursery in 1790. When grown under favourable conditions it is about 4 feet high, and generally sends out from near the top five or six branches, each bearing from six to eight scarlet flowers with a white diamond-shaped spot on each division. It crosses more freely than any other species, and about sixty years ago, it is said, with *G. Psittacinus*, produced the *G. gandavensis* or Ghent *Gladiolus*, the great common parent of the hybrids we now have. The credit of this production is given to M. Boddinghaus, gardener to the Duke of Arenberg, from whom it passed into the hands of Louis Van Houtte, the great Belgian horticulturist.

G. brenchleyensis (Brenchley's *Gladiolus*) is of similar origin

Crossed with *G. tristis* was derived *G. Colvillei*, with its variety *alba*, better known as the "bride." This is a very popular variety for pot culture and for cut flowers. With the introduction of *gandavensis*, the difficulty of crossing species was largely superseded. It crosses readily with any of the species, hence the great importance of its introduction.

Later on, Lemoine, of Nancy, by crossing *G. gandavensis* with *G. purpurea auratus*, a native of Natal, obtained his variety *Lemoinei*, and with it the foundation of another family distinguished chiefly by the introduction of a purple spot or blotch on the red, yellow, and white varieties. This family is now well known as the *Lemoinei* blotched or butterfly hybrids, and is marked by a much extended range of colour and a more open type of flower. The stalk, however, is much more slender than in the *gandavensis* strain.

Crossing this type again with *G. Saundersi*, the same grower has developed another race known as the *nanceianus* strain. This has a more open bloom still, with larger and wider petals and a wide range of brilliant colours.

Of later years Lemoine has been developing a decidedly blue-coloured strain of this favourite flower, and has produced a large class with a ground colour of lavender, blue, violet, and purple, with blotches generally darker in tint. They seem, however, to be rather delicate in constitution.

Max Leichtlin, of Baden, raised a line of seedlings by crossing and recrossing *G. gandavensis* and hybrids with *G. Saundersi*, and the stock was afterwards sold, and found its way to the United States, where they came finally into the hands of Mr. G. W. Childs. This grower has further developed them,

and they are now known as Childs' hybrids. Some very fine varieties are to be found among these, the type being much like the *nanceianus* strain, with open flowers and beautiful colours.

The *gandavensis* strain has been specially worked on in France by Souchet, of Fountainblau, and in England by Kelway, of Langport, and Burrell, of Cambridge.

Coming to Queensland, Messrs. Pink and Cowan, of the Badgen's Nursery, Wellington Point, started something like ten years ago with a choice selection of *Lemoinei* and *nanceianus* varieties. With these they were extremely successful in raising varieties of great beauty second to none, and, had they met with a sufficiently extended and appreciative market, many of their varieties would have by this time secured a world-wide reputation.

Another member of this society, Mr. Pagan, has possessed for some years a very choice selection of principally *gandavensis* hybrids, and has seedlings of his own raising of striking beauty.

So much for the history, &c., of the subject of this paper; and now as to cultivation.

Many authorities recommend a light, sandy loam; others a good, medium, friable loam; but Burrell, no mean authority, recommends a somewhat heavy loam. He says, in a lecture on the subject before the Royal Horticultural Society of England, "I have grown *Gladioli* in all kinds of soils and mixtures, and after careful consideration have come to the conclusion that the best results are obtained on a somewhat heavy, yellow loam of an adhesive nature, without any admixture of sand, a soil which I consider, if anything, even of too close a texture to grow briar roses in. On such a soil we are able year after year to keep up a vigorous and healthy stock of *Gladioli*, and no matter whether the seasons be hot or cold, dry or wet, we always have a good measure of success in producing flowers and corms. Perhaps I ought to have stated earlier that my remarks have reference to the fine hybrids of the *gandavensis* section, and I think it may be taken for granted that whatever suits these, as regards soil and general conditions, will also suit the more recent *purpurea-auratus* hybrids and and *Saundersi* varieties."

Farther on, Mr. Burrell says: "But it is a matter of history how, when a clever horticulturist like the late Mr. Standish attempted to grow these flowers on the light sandy soil of Bagshot, he utterly failed to increase or even to keep up a healthy stock, and their cultivation had to be abandoned. M. Lemoine, on the other hand, has told us, in his interesting lecture, delivered in this hall, how well he succeeds with his *Gladioli* in his nursery at Nancy, where the soil is stiff clay, and from which he distributes his hybrids in such rapid succession."

I don't think you may be exercised strongly about your soils, provided you have a fair average one, such as prevails around Brisbane, and that it is well worked and well drained.

Gladioli will certainly not thrive in a sour soil, badly drained, half sodden with stagnant moisture. Neither must they be planted with manure (particularly fresh manure) in immediate contact with the bulbs. Ground that has been well manured, but cropped previously with something else, will suit admirably.

Commence for the main display in July or early in August, but succession can be provided, if you wish, by later planting, but once the corms begin to shoot strongly they are best in the ground. Plant singly, in clumps, or in rows as may be most suitable, but let the corms be from 8 to 12 inches apart, and if in rows about 18 inches apart. Let the crown of the bulb be about 4 inches below the surface; and if you can provide a layer of sand and powdered charcoal beneath them, so much the better.

Flowers will be produced in about ten weeks with some varieties; with others two or three weeks later.

I have frequently had imported bulbs bloom in ten weeks, but they frequently fail to flower in the first year.

Keep the ground clear of weeds and occasionally hoed if you wish your plants to do their best, and stake when the flower bud begins to appear.

Unless you wish to preserve seed, it is well to cut the flower stem as soon as it has completed blooming, and thus conserve strength all you can.

It seems desecration to cut a spike of good *Gladiolus*, but one good point about this flower is that cut and kept in water it will continue to open to the last bud. When the leaves are well yellowed and flattened down, the bulbs may be lifted and stored in a cool, dry place till planting time comes round again.

I prefer to wrap mine in paper, with name on a slip enclosed, and to go over them in two or three weeks after the first wrapping to see they are properly dried.

The corm frequently duplicates itself, but varieties differ much in this respect. Some never seem to do so, and if you wish to raise a stock of any particular variety, or even to keep your stock good, care should be taken to preserve the small bulblets to be found in more or less numbers round the base of the parent. Some of the *Lemoinei* varieties are very prolific in this respect, and the bulblets are more loosely attached to the parent than in the *gandavensis* varieties.

Prepare a bed for these as you would a seed bed, and plant them in drills, marking your varieties. Many of them will soon grow, and soon become fair sized corms, and will flower in the following season. If kept too long, they lose their vitality.

This is the proper way to keep up a sound and healthy stock, and, but for this, the propagation of choice new varieties would be exceedingly slow, and the price, high enough as it is now, next to prohibitive. When grown on year by year from the original bulb, deterioration seems to come on, and the original at last runs itself out.

There appears to me in Queensland in most varieties a tendency to deteriorate in colour. Some of my darkest—notably one *Le Veuve*—becomes lighter in shade year by year, while whiter varieties develop a pink tint.

Yellows generally are unsatisfactory and of poor constitution. They seem to lose brightness, size, and quality.

I have seen the question asked several times in horticultural literature, how it is that, in a choice collection, the old *gandavensis* soon comes to the top and predominates?

There is no doubt this variety is prepotent in vitality. It increases fast by subdivision, by bulblets, and by seed, while choicer varieties do not. To keep a collection intact this variety should not be grown, and if it appears it should be ruthlessly destroyed.

Many growers hold that other varieties frequently lapse back into this, but the point is not, I believe, established.

Gladioli are readily raised from seed, and, so grown, flowered in the second year, even occasionally before. Save seed from favourite and best varieties. Prepare a seed bed as for annuals, and have it in best possible condition. Sow the seed in drills about 1 inch deep, and from 8 to 10 inches apart. Keep the bed clear from weeds, and give the young plants every chance to grow on strongly. When the tops die down lift the bulbs and store them till next planting time. If you allow your plants to seed, and the seed to scatter, you will probably have a number of self-sown plants come up. If not in the way, these may be allowed to grow on, and gathered at the proper time for planting again. You may raise some real choice varieties in this way.

Should any of the amateur members of this society intend to take up the cultivation of this beautiful flower, I would strongly recommend them to be content with a few well-selected varieties. It is a great mistake to try a large number, especially if you wish to keep your varieties distinct. To do this from season to season entails very much trouble and work; unless great care is taken, confusion will come in. Your plants can only be distinguished when in flower, and in other stages of growth resemble each other. Then you must provide

stakes or some arrangement to support your flowers. I plant mine generally in rows. This year I have driven in a stake at every twelfth plant, and to these are fastened long lengths of split bamboo at a suitable height from the ground. The spikes are then tied to these. The arrangement is not particularly sightly, but it answers well and saves a great many stakes.

A large collection takes up much room, and time must be given to ripen the bulbs before they are risen, and for such time the plants are not always pleasant to the eye.

To obviate this I leave room to plant dahlias, which are coming on meanwhile, and take the place of the *Gladiolus*. The disadvantage of this is that you must water your dahlias when necessary, and the "glads" would ripen better without shade or moisture.

Gladioli bloom in Queensland at the season we expect hailstorms, and *Gladioli* in flower have a poor chance in a hailstorm. Two or three years ago I had a sheet of splendid bloom destroyed and flattened out in a few minutes.

Have a few good varieties; stick to these, and increase your stock with bulblets—that is, supposing you wish to keep named varieties. The number of named varieties of the present day is prodigious, and second only in this respect to roses.

I am not prepared to recommend a selection, for all are beautiful, and you can hardly go wrong if you start with a few of each strain, taking care to secure an assortment of colours.

Tropical Industries.

PEABERRIES AND MALE COFFEE PLANTS.

DR. D. THOMATIS, commenting on a paragraph in the May number of this *Journal* (1899) on the subject of male coffee plants, writes:—

"As our Government Botanist, Mr. F. M. Bailey, states, the coffee plant is neither *diœcious* nor *monœcious*, but beyond doubt *hermaphrodite*, as clearly shown by the examination of its flower. Why should the abundance of *peaberries* fruit on a tree indicate that it is a *male*? Is not peaberry fruit all the same? And still more, a peaberry seed germinates as readily as a bi-lobed berry. The paragraph says that the cause of peaberry fruit is not definitely known. I am surprised at this statement, as it is very easy to find the cause, which is in the poverty of the soil and the dryness of the weather after the blossoming time, as through these two causes the young fruit could not be fully formed, developed, and nourished; hence only one lobe grew, and the germ of the other became abortive and atrophied, and consequently the single lobe or grain grew in a roundish form, and the fruit, being a single-grained berry, is richer in the essential aroma. If the ground be rich, season favourable, tree well trimmed and pruned, and blossoms thinned, very few peaberries will be produced."

Reporting on the question raised in the paragraph and in the above letter, Mr. Howard Newport, Instructor in Coffee Culture, says:—

PEABERRIES AND MALE COFFEE PLANTS.

In the accompanying letter on this subject, sent on to me for an expression of opinion, I fail to see where the question arises as to why the abundance of peaberries on a tree should indicate that it is a male.

On referring to the article in the May issue of the departmental *Journal* quoted by the correspondent, it would seem that the first mention of the idea was in the form of a contradiction. It is later contradicted by the Colonial Botanist, and is in itself a contradiction. The amount of peaberry on a tree has nothing whatever to do with the sex of coffee.

Peaberry is the result of the failure, for some reason or other, of its fellow-germ to fructify. There are naturally in the embryo berry two cells, and it would appear that under certain circumstances one of the cells, on coming in contact with the pollen, will fructify while the other will not.

That it is so is clear on examination of the peaberry where the atrophied germ is discernable, and its envelope of parchment skin, folded together, still in its place within the "pulp." The reason why the pistils should convey the pollen to one ovule and fail to fructify the other, is the point that is not thoroughly understood yet, and not the state of the tree in which it is most liable to this condition, as your correspondent seems to think.

The peaberry is a malformation, and generally takes place when the tree is weak or in a state of low vitality, and this condition may be brought about by unfavourable conditions of soil, climate, or cultivation. A tree overbearing will produce a larger percentage of peaberry than one with a more moderate crop, even though conditions of soil and climate are as favourable as could be desired.

The shape of the malformed growth is somewhat as your correspondent states. It was thought at one time that it was the production of a special variety of coffee-bush—at any rate, by those who had to do only with the cured article; and there are many yet that still adhere to this fallacy, due chiefly to the fact of its being graded separately.

Peaberry obtains its higher value in the market chiefly on account of the advantage of its shape in roasting. Being easier to roast uniformly, it is supposed to contain a greater percentage of caffeine or aromatic properties, but this is exceedingly doubtful. Its presence on the tree is of doubtful advantage also. A large percentage of "P.B." grade—indicating, as it does, impaired vitality—although its price is enhanced, is yet a long way short of the value of the double bean in the normal growth.

As a seed for propagation, "P.B." germinates readily, but repeated experiments have been able to show no advantage in the growth, stamina, or bearing capabilities of its production over that of the bi-lobed; nor does the plant raised from a peaberry show any special tendency to produce peaberries.

"Male" Trees.—The coffee-tree is, as is well known, hermaphrodite; it is also well known that in such cases generally the contact of pollen from another tree or blossom obtains better results than its own pollen. It may be, therefore, that the peaberry is due, to a certain extent, to continued self-fertilising of the plant or "in-breeding."

It is supposed that the plant commonly called the "male" coffee-tree is due to this cause. However this may be among seedlings in a nursery, there is always found a small percentage of plants that appear with long narrow leaves, eyes closer together than ordinary, and a smaller and more stunted growth altogether.

In cultivating these in the field, it is found they bear very little, although they blossom freely. (I have never yet met with one that did not bear at all.)

The flower is somewhat smaller than that of the ordinary tree, but would structurally appear to be identical. It is supposed that the want of fertility is due to some malformation of the stigma or ovules, since the pollen is perfectly fertile when applied to other blossoms.

This tendency to produce blossom that will not fertilise, yet will fertilise others, has earned for this long-leaved tree the sobriquet of "male" coffee. Whether the presence of such trees in an estate is Nature's own remedy for a too long-continued course of "in-breeding," and is, therefore, of advantage, is a moot point. Generally the plant is considered useless and unnecessary (since the other trees, being hermaphrodite, can do without it), and since it bears so little, is not considered "worth its keep." It is, therefore, usually picked out and thrown away as early as it shows the tell-tale narrow long leaf in the germinating bed or nursery.

NEW GUINEA RUBBER.

It is encouraging to learn that a high value is placed in London on rubber from New Guinea. As much as 3s. 4d. per lb. has been realised for the article in the home market. The reason for this is said to be that adulteration, so much practised in other rubber-producing countries, New Guinea not excepted, has been promptly checked in the Possession. With the cessation of adulteration, prices have rapidly risen for the Papuan production. Let us hope that with the encouragement of quick sales and high prices the collection of rubber will become one of the steady industries of the island.

The *Northern Miner* says on this subject:—"Messrs. McIlwraith, McEachern, and Co. inform me (writes 'City Man,' in the *British Australasian*) that the rubber which they receive from New Guinea has been steadily advancing in value of late, owing to the improvement which is taking place in the preparation of the article. The gentle and unsophisticated nigger, in whatever part of the world he is, has a nasty knack of adulterating the rubber which he sells to the trader, and the Papuan is not an exception to the rule. But this propensity in his case has been firmly checked lately, with the result that New Guinea rubber has been selling in London up to 3s. 4d. per lb."

COFFEE CULTURE IN QUEENSLAND.

SEED SELECTION. PREPARATION, AND GERMINATION.

By HOWARD NEWPORT,
Instructor in Coffee Culture.

THE necessity for the careful selection of seed for opening out a coffee plantation, in the first instance, does not seem to have been accorded by Queensland planters the attention it should have received.

In going round among the farmers who are growing coffee on a small scale, or who wish to grow it, I find they exercise the greatest care in selecting and scrutinising the seed corn they use, or seed cane, but they seem to consider that seed from the most abandoned coffee-tree is as good as any, or, at any rate, good enough!

In the culture of coffee, it must be borne in mind that the whole life of the tree—its healthiness, size, strength, and bearing capabilities, all depend upon the start it has. Unlike many industries, in which a mistake in starting will teach one a lesson that can be benefited by the next season on the same plot, coffee, once planted, lasts for the greater part of a lifetime, and has to flourish or fail according to its fitness, determined very largely by its treatment when young. It will be clear, therefore, that it will pay growers to exercise care in the first instance—even more care than in the case of other plants, that one ploughs out in so many months and starts afresh with. I do not mean to imply that a bad start, through inexperience or want of information, is hopeless, but rather that care and discretion at first will pay, save many a disappointment, and go a long way towards success.

In this article I purpose showing how those intending to start, may choose and select seed and plants, and how those now growing coffee may, in opening new blocks or even in supplying failures, obtain a fair start for their seedlings, and trust that such hints as I may give will be made use of.

I am confident that not only will there be a saving of a very large percentage of the cost of present methods, but, at the same time, a marked improvement in the health, strength, and consequent profit in the planted areas will be observed by a careful following up of these notes.

Selection of Seed.—In obtaining seed, in the first instance, go only to growers who, to your knowledge, cultivate their trees and keep their gardens clean. The better a tree is cultivated, the better the sample or quality of the product. A pruned tree will give an infinitely better sample than one allowed

to grow wild. Choose, therefore, a pruned tree if possible, and, unless you know that the person you are purchasing seed from appreciates the importance of selection, endeavour to get him to allow you to pick for yourself. He will probably be only too pleased to be saved the picking, and the time you will spend in doing so will be amply repaid by better results.

Seed from young trees three or four years old looks large and fine, but is not as good as that from more mature trees. Observe the state of the tree. Is it healthy and free from fungoid growths on stem, branches, and leaves? Is it green and strong, and bearing its crop well? Avoid the tree that is turning yellow, and has crinkled leaves and looks sickly. Note the shape of the tree—the hanging branches that bend downwards before turning up again at the tip, and whose tips are about on a level with the juncture of the primary and stem. Avoid the tree that sends its branches skyward so that the tip of the primary that is on a level with your breast has its juncture with the stem at a level with your feet. When you have learnt to distinguish between a healthy tree of a good class, and one that merely looks green or bears heavily (conditions frequently brought about by an unhealthy state of the tree), take large berries and those that are of a fairly uniform red colour from the lower and more mature primaries.

Having now picked your seed coffee from selected trees only, remove the fruit or “pulp” by hand or by treading, and put the seed into a bucket of water. Frequently on large estates, seed coffee is put through the pulper, but there is a fear and nearly always some percentage of loss by “bitten” or crushed beans, and, moreover, the small quantity of seed needed for a 10 or 20 acre clearing is easily dealt with by hand, and is all the better for not having been touched by machinery. Seed coffee should not be fermented; therefore the washing is only necessary for the floating off of light beans or “floaters,” and to separate any pulp that may be left with the seed. The saccharine matter will be found still adhering to the parchment or outer skin (putamen) of the seed. To absorb this and prevent mouldiness or fermentation, some wood ashes may be put in with them, after the water has been drained off, and shaken up. After this, a little drying will be of advantage, but dry by spreading out on a dry tray, paper, or cloth indoors or in the shade. Seed prepared thus will retain its vitality for some time, but it is better to sow in the germinating beds as fresh as possible.

The Time of Year to Sow.—This will vary in different parts, and depends upon the climate and rainfall. It will vary in Northern and Southern districts, and even in our district, according to elevation. The plants should be six to seven months old, and at most eight months, when planted in the field—that is to say, plants, to obtain the best results, should be as large as possible without yet having made primary branches when planted out, and this will be found to be at a height of about 9 or 10 inches. The planting season is the commencement of the rainy season. Rains set in in many places in the coffee area at about the beginning of February, and, therefore, sowing and germinating should take place about July. Where rains set in at different times, and this will vary considerably, growers will be able to calculate for themselves the time to sow. Plants germinated in August or September may still make good plants by February, and small plants are safer and better to plant out than overgrown ones.

Quantity of Plants per lb. of Seed.—A bushel of seed prepared as above is usually roughly calculated to give between 70,000 and 75,000 plants; but, as seed coffee, parchment, dry and even fresh cherry coffee is here calculated by weight, I give figures in pounds. Dry cherry *Coffea Arabica* will give roughly and allowing for peaberry, &c., from 1,400 to 1,500 plants per lb.; pulped and prepared *C. Arabica*, 1,700 to 1,800; *C. Liberica*, dry cherry, 500 to 600; and of the varieties *C. Arabica*, var. *Mocha*, 2,000 to 2,500; and *C. Arabica*, var. *Maragogipe*, 950 to 1,000 per lb. From this it will be easy to calculate the amount required for a given area. For instance, 6 feet by 6 feet gives 1,210 trees per acre; therefore, to allow for failures, accident, &c. (always have more

plants than are actually required, so that you may select the fittest even to the last), 1 lb. of prepared *C. Arabica* will be sufficient; $1\frac{1}{2}$ lb. would probably be sufficient for 2 acres, 4 lb. for 5 acres, and so on. At greater distances, say 8 feet by 8 feet, giving 680 trees to the acre, only $\frac{1}{2}$ -lb. or so of seed will be needed per acre. The figures given will be only approximate and calculated on a large and good sample. A smaller sample may run to over 2,000 to the pound of prepared *C. Arabica*, as also might a good sample if overdried.

Varieties.—This brings up the question of the best varieties of plants to grow, and consequently the variety of seed to obtain. Those mentioned are the principal of the better varieties I have seen in Queensland so far. *Coffea Liberica* is a large tree and hardy, thrives best in climates with heavy rainfall, but will thrive almost anywhere. It bears well, but the picking extends over a very lengthened season. The product is hard to manipulate and is bitter, and worth barely half what ordinary *C. Arabica* is worth. *C. Arabica*, of the Ceylon or Coorg varieties, which are most common, are hardy and good bearers. *C. Arabica*, var. *Mocha*, is small, stunted, very slow in growth, but bears well. It is doubtful, however, whether the cured article would obtain any better price than ordinary *C. Arabica*.

C. Arabica, var. *Marragogipe*, is very delicate here; bears a splendid sample of bean, but very little of it. Therefore ordinary *C. Arabica* of the common Ceylon or Coorg variety would seem eminently the best.

Germination.—Seed may be germinated artificially in a box of damp sand, or, better still, in a box or basket of charcoal freely sprinkled with water and kept under shelter or in a warm place. In this way, the seed will germinate freely and quickly in a week or so, but it must be taken out and planted into a nursery bed when the root, which will appear at the end of the bean, is not more than a quarter of an inch in length, and great care must be exercised not to break this root or the seed dies.

The safer and better way—better because it is easier and cheaper—is to sow broadcast on a small bed. To prepare the germinating bed, fork or dig up to the depth of 9 inches or 1 foot, a yard square of land for every pound or so of seed. For a quantity of seed, a long bed 3 feet wide will be found more convenient than a large square bed. Having removed from this all roots, stones the size of a walnut or larger (all stones if possible), and rubbish, loosen the soil, rake smooth and level, and trench round the bed to a depth of 6 inches. This has the effect of making the bed a raised one. Flat or sunk beds are sometimes used, but these, though convenient if irrigation is required, are found to be troublesome by getting caked in hot weather and needing constant pricking up, and becoming sodden or washed out in wet weather among other objections.

The seed should then be spread lightly on the top of this bed. It gives the plant some slight advantage if the seed can be turned flat side downwards, but this is not an important point. After having spread out evenly, cover with enough light mould to just hide the seed and no more (it is a mistake to plant deeply or press down the covering), then cover to a depth of half an inch or so with finely-cut chaff. Grass and dead leaves are used sometimes, but these have to be taken off again as soon as the seedlings come up, and the little extra work entailed in cutting the grass into chaff is repaid by having no subsequent trouble in removing it. Moreover, chaff is more readily obtainable than dead leaves in most parts of Queensland. The advantages of a covering of chaff are that, while protecting the young and delicate germs from a cold or drying wind and possible accidental exposure, it retains the moisture and heat so necessary for germination, and the young seedlings can readily at any time make their way through it.

The germinating bed having been set and covered, it must be shaded, and the cheapest and most effective method is to erect a small roof or "pandall" of sticks. Four small forked sticks, about 2 inches thick, of common scrub wood and about 2 or $2\frac{1}{2}$ feet high, put in, one at each corner of the square yard, will give sufficient support to a few more sticks laid across from fork to fork, and

some more across these again. On this a small armful of blady grass, cane trash, or leafy bushes will give sufficient shade. The shade is only to keep off the direct heat of the sun and not rain, so it need not be thick. Watering must be carried out regularly. If the weather is dry and hot, water twice a day; and if cool and cloudy, a light watering once a day will be sufficient; if rainy, not at all.

In watering, avoid doing so while the sun is on the bed, or the seedlings will sicken and die. If possible, do the watering before sunrise and after sunset. Plants will need watering all the time they are in this bed, and also possibly while in the nursery, but will need less once they are above ground. Avoid over-watering, or seedlings will rot just above the soil, and die rapidly. Seedlings will appear above ground in from three to four weeks—longer if in a colder climate—and will open their seed leaves in a week or ten days after that. During this time the nursery proper must be prepared, and, as soon as they have opened their first or seed leaves fully, they must be carefully pulled up with the finger and thumb, and pricked out into the nursery beds. My next article will deal with their treatment in the nursery, and of the preparation of the latter, as well as of "wild seedlings," seedlings from under old trees, "stump" plants, &c.

The germinating bed may be made in a portion of the area set aside for the nursery or close to the house, the area necessary being so small that almost any well-protected corner may be utilised. Seed is sometimes sown in rows or drills, but this is unnecessary, takes more time, and has not been found generally to give as good results. The pricking out of seed at 3, 4, or 5 inches apart straight into the nursery is to be deprecated. Many think it a saving of trouble and work, but it is really the reverse. In pricking out like this it is difficult to avoid planting too deep; the full extent of the nursery has to be prepared, and the whole area weeded and watered for five to eight weeks longer than necessary. In the small germinating bed the watering is a very small item, and if properly prepared this bed needs little or no weeding before the plants are ready to leave it. In pricking out seed, moreover, each failure means the watering, shading, and cultivating of so much space for nothing, while the opportunity of selecting and discarding bent or twisted seedlings is put off until a considerable amount of time and money has already been spent on them. The plants gain rather than lose by the transplantation from the germinating bed.

THE BRAZILIAN COFFEE CROP.

HAVING commenced a month earlier than usual, the Brazilian coffee crop may be expected to end sooner. Present estimates put the total for Santos and Rio at about 10,000,000 bags, barring, of course (says the *Brazilian Review*), the possibilities of a fall of prices preventing the coffee from being marketed.

QUEENSLAND RICE.

THE Annual Report of the Department of Agriculture says:—Rice, being a crop more especially adapted to the North, did not come under the ban that was placed upon the grain crops that are grown in the South, and was favoured with a good season. This is becoming a staple grain crop in that part of Queensland, the area for 1898 showing an increase of 418 acres over 1897, that for the former year being 863 acres, with a yield of 38,133 bushels, or an average of 44.19 bushels to the acre, as against 29.19 for 1897. Hitherto rice has been in the experimental stage, has been grown in many parts of the colony, and has fluctuated in area as success or non-success has been met with. It is, however, now settling down to be the property of the Northern district, and it is to that part that the future supply may be looked for, for it behoves the farmers to be

careful to grow the variety to suit the market, for of all grains rice is most subject to prejudice and favouritism. It is the grain that in the largest quantities comes into the hands of the consumer in the form that is most nearly allied to the original state, and so is dependent upon the fancies of the consumer for the variety that shall command the highest price. From the figures of the Registrar-General, Queensland at present produces 14 per cent. of its annual consumption, the statistics being—Production (estimated at the rate of 162 lb. of paddy to the 100 lb. of clean rice), 1,318,176 lb. of clean rice; and the imports, 8,235,564 lb., of a value of £49,456. The principal district for rice is that of Cairns, which produced 82 per cent. of the total yield, 708 acres being cropped for 33,540 bushels, or an average of 47·30 bushels to the acre.

Science.

GUINEA-GRASS.

MR. A. A. RAMSAY, F.C.S., Sugar Chemist to the Department of Agriculture, and superintendent of the Sugar Experiment Station, Mackay, has kindly furnished the following analysis lately made by him of Guinea-grass. He says:—

Guinea-grass has been grown for some time now at the sugar experiment station, for feed purposes and also for seed.

In July we had a number of stools of over-mature grass, which the stock would not eat, while they seemed very fond of the young leaves shooting from stools cut previously. I was led, by this, to make analyses of the two samples with the following result:—

| | Over-ripe Grass. | | Young Shoots. | |
|---------------------------|------------------|-----|---------------|--|
| Moisture | 70·92 | ... | 69·08 | |
| Soluble albumenoids ... | ·88 | ... | ·86 | |
| Insoluble albumenoids... | ·66 | ... | 2·20 | |
| Digestible fibre... | 1·94 | ... | 2·25 | |
| Woody fibre | 20·11 | ... | 13·92 | |
| Soluble ash | 1·07 | ... | 1·02 | |
| Insoluble ash | 2·29 | ... | 3·55 | |
| Chlorophyl amides, &c. | 2·13 | ... | 7·12 | |
| | 100·00 | | 100·00 | |
| Total nitrogen | ·40 | ... | ·71 | |
| Total albumenoid nitrogen | ·25 | ... | ·49 | |
| Albumenoid ratio | 1:14·3 | ... | 1:5·3 | |

I would state that these analyses are of the few stools of grass that were growing here, and available for my purpose, and no special cultivation or attention has been given them.

The grass was planted in rows 3 feet 6 inches apart and 4 feet between the stools. The average weight of the stools analysed (of over-ripe grass) was nearly 8 lb.

From figures published under the authority of the Royal Agricultural Society of England, I give, for purpose of comparison, the total nitrogen in average grass, meadow hay, and clover hay (these latter are calculated to 70 per cent. water for easier comparison). These are:—

| | | | | | |
|-------------------|-----|-----|-----|-----|---|
| Grass | ... | ... | ... | ... | 4 |
| Meadow hay | ... | ... | ... | ... | 5 |
| Clover hay | ... | ... | ... | ... | 7 |

JADOO FIBRE.

By J. C. BRUNNICH,
Chemist to the Department of Agriculture.

SEVERAL articles have appeared in this *Journal* on Jadoo fibre, an artificial fertilising product, which, so far, has hardly received in this colony the attention it seemingly deserves.

The Department of Agriculture supplied a quantity of Jadoo fibre to the Agricultural College for experimental purposes, and the results of these experiments will be looked for with interest, although in our rich College soils the effects might not be so marked as in poorer soil.

In order to see if what the inventor claims is really true, I made a complete analysis of the product with the following result:—

I found Jadoo fibre to be a fine fibrous product, of brownish colour, which, almost like a sponge, has the power of absorbing an enormous quantity of water up to six to eight times its own weight. This fact alone will explain part of its practical value, when used for pot plants, in the orchard or vineyard. This fibrous raw material is saturated with plant foods, which, according to analysis, are to a large extent soluble in water, any plant having thus a fair amount of plant foods at once available for its growth; another portion of the plant foods are like some in the soil not soluble in water, but soluble in hydrochloric acid, and these will become available gradually, by the chemical dissolving action possessed by the roots of growing plants. As a matter of fact, Jadoo fibre must be considered a highly fertile artificial peaty soil.

Analysis.

| | |
|---|-----------|
| Organic matters | Per cent. |
| Containing '812 per cent. of Nitrogen = '986 per cent. Ammonia. | 71.40 |
| Mineral matters— | |

Soluble in water (total, 4.36 per cent.)

| | Per cent. |
|--|-----------|
| Phosphoric acid, P_2O_5 | .445 |
| Sulphuric acid, SO_3 | 1.286 |
| Nitric acid, N_2O_5 | .520 |
| Alumina and iron, Al_2O_3 , Fe_2O_3 | .271 |
| Lime, CaO | .303 |
| Magnesia, MgO | .107 |
| Potash, K_2O | .357 |
| Soda, Na_2O | .750 |
| Ammonia, NH_3 | .020 |

Soluble in hydrochloric acid, 1.1 sp. gr.

| | Per cent. |
|----------------------------------|-----------|
| Silica, SiO_2 | .031 |
| Sulphuric acid, SO_3 | .926 |
| Phosphoric acid, P_2O_5 | .715 |
| Alumina, Al_2O_3 | .765 |
| Iron, Fe_2O_3 | .170 |
| Lime, CaO | 1.875 |
| Magnesia, MgO | .163 |
| Potash, K_2O | .402 |
| Soda, Na_2O | .791 |

| | |
|-------------------------|-------|
| | 5.838 |
| Insoluble in HCl | 4.012 |

| | |
|------------------|-------|
| Total ash | 9.85 |
| Moisture | 18.75 |

The inventor does not claim the product to be a manure, and in accordance with the analysis the actual value of the plant foods, phosphoric acid, potash, and nitrogen amounts to 15s. per ton of Jadoo fibre. The secret of the preparation lies in the foundation material, which has the power of absorbing and retaining the fertilising ingredients, which are thoroughly incorporated with the fibre by a slow process of fermentation.

I believe the manufacture of this product could be successfully started in this colony, and I do not think that a better foundation material could be found than finely crushed megass from a sugarmill. Megass by itself has only a very slight manurial value (about 6s. per ton), but megass possesses great absorptive power, and retains water just as well as Jadoo fibre, and, again, does not rot quickly in the ground. Perhaps finely chopped trash, or, again, dried filter press cake might be added with advantage to the megass.

Forestry.

TASMANIAN BEECH.

AMONGST the timbers of Tasmania, beech, or "myrtle," grows in immense forests, the largest trees having a trunk of 40 feet to the first limb, and a diameter of from 2 feet to 6 feet. It is somewhat like the European beech in working, but tougher and rather heavier. It is a capital wood for all inside work, cask-making, tools, floors, and furniture; it wears to a smooth surface, and stands well *if cut in the winter*. There are two varieties of this timber—viz., the red and white.

SPRUCE PULP FOR NEWSPAPER.

SPRUCE pulp for newspaper, and the extent to which it is consumed, is set forth in tabular form in the *Boston Transcript*. From this table it appears that one cord of spruce wood, or 615 feet B.M., will make $\frac{1}{3}$ -ton of sulphite pulp, or 1 ton of ground wood pulp. Newspaper stock is made up of 20 per cent. sulphite pulp and 80 per cent. of ground wood pulp. The best spruce lands, virgin growth, possess a "stand" of about 7,000 feet B.M. to the acre; and 22 acres will therefore contain 154,000 feet B.M. of timber. An average gang of loggers will cut this in eight days, and any large pulp-mill will convert this amount of timber in one day into about 250 tons of the class of paper-pulp used in newspaper stock. This pulp will make about an equal weight of paper ready for the Press, and this paper will be used up by a single large city newspaper in about two days.

LAKE HARRY DATE PALMS.

THE Conservator of Forests, Mr. W. Gill, returned on Tuesday from a visit to the date-palm plantations in the far north. During his inspection of the Lake Harry palms he was pleased to find that the seedlings raised from the dates sent out by the Hon. T. Playford, M.P., when Agent-General, have made good progress, being from 3 feet to 5 feet in height. One or two have flowered though not yet four years old. The Algerian palms are also looking well, and several have already set good bunches of fruit, which give promise of maturing satisfactorily in due course. They have all had thorough cultivation, and are in excellent condition for increased growth during the coming season. The palms at Hergott continue to develop steadily, and will shortly receive a thorough cultivation prior to the starting of their usual summer growth.—*Adelaide Observer*.

TREE PLANTING BY FARMERS.

Tree planting by farmers is being encouraged in a practical way by the Division of Forestry of the United States Department of Agriculture. A circular has recently been issued stating that the Division is prepared, as far as a limited appropriation will permit, to render practical and personal assistance to farmers and others by co-operating with them to establish forest plantations, wood lots, shelter belts, and wind breaks. An expert tree planter has been placed in charge of a section of the Division which has been organised for this work, and he will be assisted by collaborators in the different States who are familiar with local conditions. It is proposed that visits be made by the superintendent of tree planting or his assistants to the lands of farmers desiring aid in forestry, and that working plans be given, including help in the selection of trees, information about planting, and instruction in handling forest trees after they are planted. Copies of the circular may be obtained by those interested in the subject on application to the Bureau of Forestry, Department of Agriculture, Washington, D.C.

SOME TIMBER TREES OF QUEENSLAND.

By J. W. FAWCETT,
Member of the English Arboricultural Society.

THE SPOTTED GUM (*EUCALYPTUS MACULATA*, Hook).

BOTANICAL DESCRIPTION.—The Spotted Gum is a fine, large, handsome tall tree, growing to a height of from 60 to 100 and even as much as 150 feet, with a diameter of from 2 to 4 and even 5 feet. It very often reaches the height of 50 to 70 and even as much as 90 feet without a branch.

Bark.—The bark is smooth, and of a whitish colour. It is deciduous, and falls off in patches, leaving an indentation where each piece was peltately attached, and thus giving the trunk a mottled or spotted appearance.

Leaves.—The leaves are alternate or opposite, often very large and coarse, ovate-lanceolate or lanceolate-falcate in shape, from 4 to 6 inches or more in length.

Flowers.—The flowers are large and paniculate, and are in flower from June to August and September.

Fruit.—The fruit is a semi-globose or pitcher-like capsule, about $\frac{1}{2}$ inch in length, and nearly as much in breadth. The seeds, which are black, are ripe from March to May.

VERNACULAR AND BOTANICAL NAMES.—The Spotted Gum, so named from the bark falling off in patches and giving the stem a spotted appearance, is also known as the Sugary Gum, from the supposed sweetness of the pollen of the flowers.

DISTRIBUTION.—The Spotted Gum is found only on poor soils, and is generally found on clayey lands and on stony ridges in the coastal districts of Southern Queensland, and also in New South Wales. When growing on volcanic and rich soils it yields a valuable timber, but that of low, sandy, and poorer soils is only moderate.

USE.—The Spotted Gum yields a very elastic, durable, strong, tough, lightish grey timber. It is very valuable and highly prized for many purposes, on account of its great strength and elasticity, in carriage and wheelwright's work, for the manufacture of buggy shafts and poles for felloes and the cogs of wheels. In bridge building it is used for members under tension, and has been found to have the highest constant strength of any of the Queensland timbers. It is also employed in shipbuilding and the manufacture of staves for casks. The sapwood decays quickly, but the heartwood is said to be as strong as British Oak. It is of a greasy nature, but works well. It would prove a suitable timber for paving blocks.

The Spotted Gum yields a yellowish-brown gum resin in great quantities, which exudes from cracks and wounds through the inner bark. This gum contains about 35 per cent. of kino tannin. In smell, it much resembles the liquid *Styrax*, which is used in Europe for the cure of itch. It is nearly free from Arabin, but contains a resin soluble in spirits, which swells up and softens in hot water, so as to give a nice emulsion. This gum-resin is often used, with good effect, externally as a cure for chronic cystitis.

There is a variety of Spotted Gum, *E. maculata*, var. *citriodora*—the Citron-scented Gum—which differs only from the normal form in the foliage, having a strong citron-like fragrance. It is found in open forest country between the Burnett and Fitzroy rivers.

THE WOOLLY-BUTT (*EUCALYPTUS BOTRYOIDES*, Sm.).

BOTANICAL DESCRIPTION.—The Woolly-butt is a very large and lofty spreading tree, of varied form, growing to an average height of from 60 to 80 and 100 feet, with a diameter of from 2 to 3 and 4 feet. In some places it is of crooked growth and gnarled appearance, and only of small size; in others it towers to a considerable height, and the trunk is sometimes destitute of branches to a height of 80 feet, and specimens are often met with having a diameter of from 6 to 8 feet.

Bark.—The bark is rugged or roughly furrowed, persistent at the base and for some distance up the trunk, and white and deciduous on the upper part of the trunk and the branches.

Leaves.—The leaves are usually alternate, lanceolate, straight or curved, thick, from 4 to 6 inches or more in length.

Flowers.—The flowers are from four to ten in number, in axillary or lateral flattened or angular peduncles or flower-stalks.

Fruit.—The fruit is a smooth ovoid-oblong capsule, about $\frac{1}{2}$ inch in length.

VERNACULAR AND BOTANICAL NAMES.—The Woolly-butt, so called from the fibrous or woolly nature of the bark at the butt or base of the trunk, is also known as the Bastard Mahogany and Swamp Mahogany (from some resemblance the timber has to the true mahogany), Bluegum (from the bluish-white colour of the bark in the upper part of the trunk), and Bangalay or Bangalloy (an aboriginal name, and one by which the timber is best known to many of the carpenters of New South Wales). The specific name (*Botryoides*) was given to this species by Sir J. E. Smith, in allusion to its bunches of flowers.

DISTRIBUTION.—The Woolly-butt is found of frequent occurrence on river flats and on the banks of streams, where it luxuriates best, and also on sandy places on the coast, and in mountain gullies in South Queensland, and also in New South Wales, Eastern Gippsland in Victoria, and Tasmania.

USE.—The Woolly-butt yields a hard, tough, durable, strong, close-grained, red timber. It is very valuable, and as it is usually found to the centre, it is admirably adapted for use in waterworks and wheelwright's work, especially in the manufacture of wagons, and felloes for wheels. It is one of the finest timbers for use in shipbuilding, especially for knees and ribs. It is also useful in large buildings, and in all works where large beams of hardwood are required. It is also useful as fencing timber, posts of this timber having been found to be sound after a period of fourteen years. It is also useful for shingles, and is a suitable timber for the manufacture of paving blocks. It also furnishes a good timber for firewood.

The bark of this tree was employed by the aborigines as a medicine in the cure of dysentery. They used to steep the bark in water for some time, and then drink the fluid.

This tree, one of the most stately of our *Eucalypts*, is remarkable for its dark-green, shady foliage, and is one well worth planting for either shade or ornament.

THE RED MAHOGANY (*EUCALYPTUS RESINIFERA*, Sm.)

BOTANICAL DESCRIPTION.—The Red Mahogany is a very large and lofty tree, attaining to a height of from 60 to 100 and even as much as 150 feet, with a diameter of from 2 to 3, and 4 feet.

Bark.—The bark is rough, fibrous, and of a dark or reddish colour. It is persistent on the trunk, but is more or less deciduous on the branches.

Leaves.—The leaves are alternate or opposite, lanceolate, straight or curved, generally thick and very large, measuring from 4 to 6 or more inches in length.

Flowers.—The flowers are six or more in number on each peduncle or flower stalk.

Fruit.—The fruit is a semi-ovate capsule and the seeds are ripe in June.

VERNACULAR AND BOTANICAL NAMES.—The Red Mahogany, so-called from the colour of its timber and the resemblance to the true mahogany, is also known as Forest Mahogany (from its habitat), Redgum, Red Ironbark (a misnomer) and Jemmy or Jimmy Low—the latter an English contraction of an aborigine word for this tree—*tchimmeelo*—and the one by which it is best known in Southern Queensland. It is also known as Leather-jacket (from the leathery texture of its bark), and as Hickory. The specific name *resinifera* was given to it by Sir J. E. Smith, the founder of the Linnæan Society, from the large quantity of kino or gum which exudes from it.

DISTRIBUTION.—The Red Mahogany is found in the coastal districts of Queensland as far north as the Daintree River, but not very common. Some of the finest species are in the neighbourhood of Maroochy in the South part of the colony. It is also found in the coastal districts of New South Wales.

USE.—The Red Mahogany furnishes a very strong, durable, red timber, extensively used for large beams in buildings, rafters, rough carpentry, and also for house work. On account of its superior strength and durability it is used for piles for jetties and wharves, resisting for some time the attacks of the cobra. It is in great demand for fencing, and lasts for many years. In New South Wales fencing posts of this timber have been found to be sound after a period of 50 and 60 years. Another instance of its durability is given in the same colony. In building St. John's Church at Parramatta in 1798, rafters of this timber were employed, which were found to be quite sound when the church was pulled down in 1852—after a period of 54 years. It is a suitable timber for paving blocks. The gum of this tree yields about 66 per cent. of kino tannin, and is valuable as a medicine in diarrhœa. This gum or resin had the honour of first bringing into notice the celebrated medicinal kino.

This tree is one that is largely planted in countries outside Australia, and has proved to be one of the best adapted for a tropical climate, although it has not so rapid a growth as other species of *Eucalypts*. In the north-west provinces of India it has been found to grow at the rate of from 4 to 6 feet per annum. In Italy it has proved almost as hardy as the Mountain Ash, *E. amygdalina*, Labil., and the Manna Gum, *E. viminalis*, Labil.

THE SWAMP MAHOGANY (*TRISTANIA SUAVEOLENS* Sm.)

BOTANICAL DESCRIPTION.—The Swamp Mahogany is a moderate-sized tree, though often attaining large dimensions. Its height averages from 50 to 80 or 100 feet, with a diameter from 24 to 50 inches.

Bark.—The bark is persistent, somewhat fibrous and soft.

Leaves.—The leaves are alternate, petiolate (having a leafstalk), ovate-lanceolate in shape, from 3 to 4 inches in length, and more or less downy or hoary, as are also the young shoots.

Flowers.—The flowers are in pretty white small axillary cymes, on a common peduncle or flowerstalk, and appear in bloom from November to January, and are sweetly scented. They are much sought after by bees.

Fruit.—The fruit is a small capsule about one-sixth inch in diameter, which seeds in May and June.

VERNACULAR AND BOTANICAL NAMES.—The Swamp Mahogany, so called first from its growing in swampy localities, and secondly from the resemblance of its timber to mahogany, is also known as the Broad-leaved Water Gum (from the shape of the leaves and the locality of its growth), the Sweet-scented Gum (from the smell of its flowers), and also the Bastard Mahogany and the Bastard Peppermint. The generic name *Tristania* was given to this genus by Dr. Robert Brown (one of the greatest botanists of the age, and the one who laid the foundation of a thorough scientific knowledge of Australian botany), from the disposition of the flowers and leaves, and the specific names of this species—*suaveolens*—was given to this tree by Sir J. E. Smith (the gentleman who purchased the herbarium of the great Swedish Naturalist, Linnæus, and who was the founder of the Linnean Society, the greatest society devoted to botany in the world) from the sweet scent of its flowers.

DISTRIBUTION.—The Swamp Mahogany is found along the banks of fresh-water streams, and often on the borders of and even in marshes and swamps in the coastal districts of Queensland, and also in the northern portion of New South Wales and North Australia.

USE.—The Swamp Mahogany yields a strong, durable, elastic, tough, reddish-coloured timber, resembling very much that of the Spanish Mahogany. It is hard and close grained, and is a remarkably fine material for various kinds of work, either underground or under water, have been found to be extremely durable. It is extensively used for piles for wharves and jetties, as it is found to resist the ravages of the *teredo*, or cobra, much longer than many other timbers which have been tried up to the present. It is also a good timber for piles for bridges, and for boatbuilding. It is also useful for carpenters' mallets and the cogs of wheels in machinery. When dried properly it works easily, but it warps very much in drying. It is used by the aborigines for making boomerangs.

The flowers of this tree are amongst the most valuable honey producers. They produce, perhaps, the finest in this colony, the honey being of a delicate colour and of a delicious peachy aroma and flavour.

There is a variety of this tree—*Tristania suaveolens*, var. *glabrescens*, which differs from the normal form in having its foliage destitute of hoariness, and in having bright glossy or shiny-green leaves. It is found in low, almost swampy, localities in South Queensland.

THE CHEMISTRY OF MATERIALS OF ENGINEERING.

By Professor A. H. SEXTON, F.I.C., F.C.S., &c.

MATERIALS OF CONSTRUCTION.

WOOD.

WOOD.—Wood is very largely used for structural purposes, both temporary and permanent, its strength, its elasticity, and, above all, the ease with which it can be worked, rendering it specially valuable.

Structure of a Tree.—Wood is the more or less hardened tissue of certain perennial plants—the timber trees—and as the chemical and physical characters of the wood are largely determined by the way in which it is produced, it is necessary to describe very briefly the structure and growth of the plant. All timber trees belong to the botanical class of the exogens or dicotyledons; the endogens or monocotyledons, such as the tree-ferns, having a very different structure, and being quite useless for timber.

When an ordinary timber tree is sawn across, it is seen to be made up of a series of more or less concentric rings—the annual rings, or rings of growth—which surround a central small core, the pith, and the whole is enclosed by a more or less thick layer of bark. Through the mass of the wood passes a number of minute radial lines, the medullary rays, which begin at the outer surface of the wood and pass inward, some few reaching to the pith.

When the tree is living, the actual living growing part is confined to a thin layer—the cambium—lying between the wood on the inside and the bark on the outside, and forming both by the division of its cells. In this climate growth is at a standstill during the winter, but as soon as spring comes it recommences, the cambium cells divide up and become specialised, forming on the one side the wood and on the other the bark cells. At first, in spring, when the supply of nutriment is not very large, the cells are large and thin-walled, whilst, as the supply of nutriment becomes larger, the walls of the cells become thicker, and therefore the cavities smaller; thus the outer portion of each annual ring is different in colour to the inner portion, and as the dark portion of one ring comes against the lighter portion of the next, the rings are clearly marked. In tropical countries, where growth keeps on all the year round, the distinction between the annual rings may be quite obliterated. The cells of the cambium become very much modified in form, the exact form varying with the nature of the wood, but the wood is always made up of elongated cells packed closely together, thus producing the fibre or grain of the wood, the fibres being more or less broken up by the cellular patches of the medullary rays, and through the mass running parallel with its fibres there may be ducts or passages, or long vessels.

Water in Wood.—When the tree is living it always contains a very large quantity of water (50 to 70 per cent.), this being much greater in the younger parts of the plant than in the older, and greatest of all in the leaves. The amount of water varies with the season, and is always greatest when the growth is most active—in the summer. Even when there is most water present, however, the vessels are largely filled with air, so that the wood is lighter than water and will float, though the materials of which it is composed are actually heavier.

Felling Timber.—When wood is to be used for timber it should be felled in winter or early spring, when vitality is least active, as then the amount of water present is much less than at other seasons. The bark is then stripped off, and the wood is left exposed to the air, lifted off the ground and sheltered from the rain for months or years, till it becomes air-dried, and in this condition it may contain from 10 to 15 per cent. of water. The more perfectly the wood is dried, the more durable is it likely to be when used in structures.

Shrinkage of Wood.—As the wood loses water it shrinks, and the shrinkage is greater in the case of the newer wood than the older, and as this new wood is outside, the contraction necessarily produces radial cracks. If planks be cut out of the wood before the shrinkage is complete, or if the wood be subsequently more thoroughly dried, they will warp, the warping always being determined by the greater contraction of the younger wood. Dry wood exposed to moist air will absorb moisture, and this causes an expansion exactly the reverse of the contraction produced on drying the absorption of water, and corresponding expansion being due to the presence of constituents in the cells, which absorb water and expand in so doing. The expansion may be so great that the cracks in a dried disc may completely close up.

Formation of Wood.—The cells in the living and growing cambium layer have thin walls of cellulose, and contain the nitrogenous matter known as protoplasm. As these cells become converted into woody tissue, the walls become very much thickened and changed in character. The protoplasm to a large extent disappears, and the cells and vessels contain various elaborated products, such as starch, resins, gum, &c., the nature and quantity varying with the plant.

Cellulose.—The primary constituent of the cell wall in the young and growing plant is cellulose, a substance which is to be had in a nearly pure form in cotton and unsized paper. It has the formula ($C_6 H_{10} O_5$), and contains carbon 44.44 per cent., hydrogen 6.17 per cent., and oxygen 39.39 per cent. It is very inert to all ordinary decomposing agents, such as air and moisture, but is acted on by certain re-agents, yielding products which are of commercial importance.

When cellulose is treated with sulphuric acid it is converted into an amorphous mass known as amyloid. Advantage is taken of this reaction in the manufacture of parchment paper, which is paper which has been partially converted into amyloid by the action of sulphuric acid.

When cellulose is treated with a mixture of nitric and sulphuric acids it gives rise to nitro-substitution products, the most important of which $C_{12} H_{14} (NO_2)_6 O_{10}$, is called pyroxyline or gun cotton, and is a powerful explosive. Nitro-cellulose treated with camphor yields the substance celluloid, which is so largely used for the manufacture of small articles.

Treated with an ammoniacal solution of copper oxide the cellulose is dissolved, and is reprecipitated from the solution on addition of acid. When such a solution is evaporated it leaves a gummy mixture of copper, oxide, and cellulose. Willesden water-proof paper is prepared by passing paper through the ammoniacal solution and then drying it. The amorphous layer of copper, oxide, and cellulose left on the surface is perfectly water-proof.

Composition of Wood.—As the growing cells become differentiated into the wood cells, and the walls become thickened, the cellulose undergoes very great changes. On the outer side of the cambium layer various complex adipocelluloses are formed, and on the inner side various ligno-celluloses. Ordinary woody tissue is largely made up of ligno-cellulose—a mixture of cellulose and lignine. Lignine has the composition $C_{18} H_{24} O_{10}$, and contains, therefore, 55.5 per cent. of carbon, and it is comparatively richer in hydrogen than cellulose. In addition, the cells contain, intermixed with the cellulose and lignine, small quantities of complex bodies containing nitrogen. The cells themselves may contain starch and other materials stored up by the plant for its future use, and the vessels may contain resins and other complex bodies.

Wood, therefore, cannot be regarded as being a definite substance, but rather as being a mixture of substances, some of which are much less stable, and are more readily attacked by organisms and inorganic re-agents than others.

The average composition of dry wood is about—Carbon, 50 per cent.; hydrogen, 6 per cent.; oxygen, 41 per cent.; nitrogen, 1 per cent.; and ash (mineral matter), 2 per cent.; but all the constituents vary somewhat according to the nature, age, &c., of the wood.

Seasoning of Timber.—Wood, as has been mentioned above, is always seasoned before use. The object of the seasoning is to get rid of as much water as possible, and thus to reduce the weight and to dry up the more easily decomposable matters in the sap. Air seasoning is generally used. The wood is then stacked so as to be protected from sun and rain, and so as to be freely exposed to the air on all sides—a free circulation of air being one of the chief essentials of good seasoning. Air seasoning may occupy from two to four years. In water seasoning the wood is kept under water for some time. In hot-air seasoning the wood is exposed to air artificially warmed to a temperature of from 100 degrees Fahr. to 250 degrees Fahr. Various other methods of seasoning are used occasionally.

Varieties of Wood.—Many woods are used for constructive purposes, and they vary very much in character and properties. Some are used on account of their strength, others on account of their colour or the grain which they show on the cut surface, and others for other characteristics.

The only classification of woods that need be mentioned here is their division into soft and hard. The soft woods are chiefly derived from the coniferous trees, and contain various resins, though the birch, which yields a soft wood, is not a conifer. All the other timber trees yield hard woods. The hard woods are usually more durable than the soft woods.

Durability of Wood.—Wood, under suitable conditions, is very durable, but under others it decays rapidly. The constituents of wood are so inert that the decay is never brought about by the action of chemical forces alone, but always requires the aid of the lower forms of life; the conditions, therefore, which favour the decay of wood are always those which favour the growth and development of the organisms which produce it.

Dry Rot.—The best-known disease of wood is that known as dry rot. The wood becomes darker in colour, decreases in weight, acquires a musty smell, and may become so soft that it can be cut with a knife, "almost like cheese" if it be wet, but, if dry, crumbling under very slight pressure to a brown powder, and thus the wood becomes weak and thoroughly rotten. Dry rot is produced by the growth of a fungus (*Merulius lacrymans*), which lives on the wood and ultimately destroys it. The spores of the fungus germinate on damp timber; their germinal filaments pass into the wood, pierce through the cell walls and among the cells, so as to draw nutriment from the nitrogenous matter, lignine, and other materials present on which they can live, and thus, as it uses up part of the material, it disintegrates and breaks up the remainder.

The conditions which favour the development of the fungus are of two kinds—those of the wood itself, and those of the surroundings. The less perfectly the wood has been dried, the more readily will the fungus be able to find nutriment. Moisture is essential to the development of these forms of life, and unless this be present the "rot" cannot set in. "*Dry timber kept dry is proof against dry rot*" (Marshall Ward's "Timber and Some of its Diseases," page 191). One of the prolific causes of dry rot is the use of wood not sufficiently seasoned. Professor Ward says, "It is clearly an act worthy of a madman to use fresh, 'green' timber for building purposes; but it seems certain that much improperly dried and by no means 'seasoned' timber is employed in some modern houses. Such wood is peculiarly exposed to the attacks of any spores or mycelium that may be near."

As to the surroundings, dampness is one of the most important favourable conditions; and if the wood itself be not damp, it may be in contact with damp masonry or other things, and may be surrounded by a damp, stagnant atmosphere. These, with darkness and moderate warmth, are just the conditions under which the fungus can grow and flourish.

Obviously, therefore, if dry rot is to be prevented, not only must the timber be put in dry, but it must be kept dry, and the space around it must be kept thoroughly ventilated.

It must be remembered that the disease is always propagated by the spores or mycelium of the fungus. As these spores are extremely small, not more than $\frac{30}{1000}$ of an inch in diameter, and are very light, they will be easily carried about, and one piece of timber may infect many others. Dry rot, as far as it is known, only attacks wood in buildings, &c., and is unknown in the forest. There are, however, many other fungi which produce similar results. In a fine forest, it is frequently found that the stumps of the trees which have been cut down, whilst little changed in appearance, have become so rotten that they can easily be broken up, and often they fall in a powder under pressure. This change is due to the action of various fungi, the function of which in nature is, no doubt, to break up and destroy useless wood.

Wet Rot.—Growing trees are as subject to decay as cut timber, the heart wood being usually attacked, the tree being often left hollow. This is likewise usually, if not always, due to the action of a fungus, which, living on the nutritive portions of the wood, breaks up and destroys the remainder.

Other Cases of Decay.—Wood decays more or less rapidly in almost all positions, the decay being always the result of the growth of the fungi, or other low forms of life, at the expense of the wood, since the constituents of the wood are so inert that—apart from the action of living organisms—there would be little tendency to decay.

Preservation of Timber.—Obviously, if the decay of timber is produced by the action of living organisms, the decay can be prevented by destroying the organisms, or making the conditions such that they cannot thrive.

If the wood is perfectly dry, painting the surface, or covering it with a layer of some impervious material, may preserve the timber; but if it be at all damp, then such a coating will do more harm than good, for it will prevent the escape of moisture, even if the surface be exposed to the air. It very often happens, therefore, that a carefully painted piece of timber will be destroyed, except for a thin external shell.

The fungus is killed by creosote, mercuric-chloride, copper sulphate, and many other mineral poisons; but the mere application of these to the surface of the wood is of little avail, as decay may still go on in the interior. Similarly, charring is only a very partial protection; the layer of charred wood gives some protection, and in charring the wood below will be more or less thoroughly dried, but moisture will soon be absorbed again, and then decay may set in.

The only satisfactory method of preventing the "rot" is to thoroughly saturate the timber with the antiseptic solution—that is, the air in the cells and vessels must be completely, or at any rate to a large extent, displaced by the antiseptic solution, so that the material on which the fungus has to feed is effectively poisoned.

In Bethell's process, which is perhaps the most generally used, the wood is dried, placed in an iron cylinder, and creosote is pumped in at a temperature of about 120 degrees Fahr., and at a pressure of about 170 lb. per square inch. Very frequently the vessel is first exhausted of air, so as to facilitate the escape of the air from the wood. Soft wood may absorb about 10 lb. of creosote per cubic foot, whilst hard wood, such as oak, will take very much less. Creosoting seems to be the most efficacious method of preserving timber.

Kyan's process (Kyanising) consists in saturating the wood with a solution of mercuric-chloride (corrosive sublimate); in Boucherie's process, copper sulphate is used; and in Burnett's, zinc chloride.

Attacks of Animals.—Under some conditions, wood is liable to be attacked by animals of various kinds, boring animals occurring both in earth and in water. For wood which has to be buried in earth, charring seems to be a fairly good protection, and creosoting also answers very well.—*Practical Engineer.*

[Charring posts set in the ground is a very poor protection against the attacks of white ants, especially when unsapped posts are used. The charred portion cracks, and thus gives clear access to the untouched timber beneath the burnt portion.—Ed. *Q.A.J.*]

General Notes.

HOW TO MAKE A SAFETY LIGHT.

TAKE a clear glass bottle, such as a small vial, and put a small piece of phosphorus about the size of a pea into it, and see that the cork is sound and a good fit. Then get a little of the clearest olive oil, such as that sold for table use, heat it to boiling point, and then pour it on top of the phosphorus. Fill the bottle about one-third full, and then cork tightly.

When requiring a light, remove the cork to allow air to enter, and then cork up again, and the whole of the empty space in the bottle will now become luminous, giving sufficient light to read the time by a watch, or for other purposes when a night light is required.

As the light becomes dim it is only necessary to withdraw the cork again to allow a fresh supply of air to enter.

A bottle used like this will continue to give light for some months; but it should be kept warm during the winter time, for should the oil become solid through the cold the vial will have to be held in the hand for some time to warm it sufficiently to act.

WARTS

THERE are many so-called remedies for warts on animals which are more or less non-effective. The latest we have heard of appears to have proved successful in the case of dogs. A gentleman in England had a beagle puppy whose mouth, tongue, lips, and face were covered with white warts closely packed together. Several so-called remedies were tried without result, and the dog died, choked. A year or two after he had a cob with warts over the shoulder, neck, and face, when, either in print or from hearsay, he learned that warm bullock's blood would remove them. This was tried, on the principle that if it did no good it could do no harm; result, after two or three dressings the warts disappeared, and did not come any more.

Another case. Five years ago he had six greyhound saplings, whose mouths, tongue, and lips, outside and in, were covered with warts. It was two days after discovery before he was able to get to the butcher when killing. By this time a fine crop of warts had developed. The method was this: As soon as the bullock was knocked down and stuck, the dogs' heads were dipped in a bowl of the live blood, and all the parts affected were well rubbed with it while warm (after it begins to clot or solidify it is no use). The day after the first dressing the warts turned brown. Two days after they were dressed again. The following day they (the warts) began to get soft, and looked rotten, many of them falling out on being handled. After two days, dressed again, when they all disappeared, leaving small marks such as smallpox leaves. After a time nothing could be detected at all.

He gives this as his experience. At all events, it is harmless and painless, and the price of a pint or two to the butcher is not costly.

This remedy might be tried in the case of fowls. Warts on chickens may, however, be absolutely cured by dipping the fowls' heads in urine. After a few applications of this remedy the warts disappear. We cured nine valuable cochin chickens in this manner, whose heads were a mass of warts.

A NEW TEXTILE PLANT.

APOCYNUM VENETUM.

A NEW textile plant is being experimented with in Russia (says United States Consul Atwell, of Roubaix). This is the *Apocynum venetum*, a bush about 6 feet high, yielding a silken fibre. It grows in Europe, Siberia, Asia Minor, North of India, Manchuria, and Japan, and it has long been used by the Turcomans in the manufacture of cords and woven goods. It has never been cultivated, and grows best inland under water for part of the year. The fibre has great strength, and its cultivation would require no care. In 1895 the Russian Government began to use it for bank-note paper, and the results were so excellent that the plant has since been cultivated at Poltava.

HOW LONG PLANTS WILL LIVE.

AnnuaIs.—Some plants grow up, flourish, produce seeds, and die in one year; they are called annuals. These are again divided into the hardy—such as the rocket larkspur, candytuft, nemophila; the half-hardy, which need protection and artificial heat in their early stages, such as the China aster, phlox drummondii, marigold; and the tender annuals which should be cultivated in a greenhouse.

Biennials are plants which flower and bear fruit only in their second year, and then die. They do not flower in their first year. The foxglove is a biennial, so also is the wallflower, stock, carrots, turnips, parsnips, &c. Biennials may become annuals if sown early and forced to develop their flowers, while, if seeding be prevented, some may last longer than two years.

Perennials.—Plants which continue for several years, and which exhibit a great variation of longevity.

RELATIVE VALUE OF DIFFERENT FOODS FOR STOCK.

ONE hundred pounds of good hay for stock are equal to:—

| Articles. | Lb. | Articles. | Lb. |
|---------------------------|------|--------------------------|-----|
| Beans | 28 | Oats | 59 |
| Beets | 669 | Oil-cake, linseed | 43 |
| Clover, red, green | 373 | Peas, dry | 37½ |
| Carrots | 371 | Potatoes | 350 |
| Corn | 62 | Rye-straw | 429 |
| Clover, red, dry | 88 | Rye | 53½ |
| Lucerne | 89 | Turnips | 469 |
| Mangolds | 368½ | Wheat | 44½ |
| Oat Straw | 317 | | |

GROW YOUR OWN TOBACCO.

TOBACCO is a good thing on any farm. As dry dust or stems or a "tea" made by steeping, it will kill insects. If a farmer does his duty towards his insect foes, his bill for insecticides will be very large. Why not save part of it by growing your own tobacco? Set out a dozen or two plants, and cultivate them as you would tomato plants. Dry and cure them ready for use. This is not mere theory. It is just what many farmers and gardeners are doing.

TOBACCO.

ONE of the most important truths established by the application of science to tobacco is the annihilation of the old idea that this crop exhausts the soil to an extraordinary degree. The truth is, no crop is exhaustive if it is properly fertilised; all that is required is to supply an abundance of every element that the plant needs. Tobacco takes no more from the soil than corn or potatoes. It takes a little more of some ingredients, and less of others. Below is a short table showing the relative amounts of nitrogen, potash, and phosphoric acid taken by the three crops on analysis from 1 acre:—

| | Nitrogen. | Potash. | Phosphoric Acid. |
|-----------------|-----------|---------|------------------|
| Tobacco | 65 | 89 | 8 |
| Corn | 74 | 16 | 30 |
| Potatoes | 58 | 101 | 32 |

The actual amount removed by a crop of tobacco leaf from the soil is very little, if the stalks are returned to it, and if a nitrogenous crop be grown and ploughed in, such as the cow pea, during the fall, it will supply an abundance of plant food, which, with the assistance of fertilising, will enable you to regulate your quality of tobacco.

ENGLISH WHEAT CROP.

THE agricultural expert, Sir John Bennet Lawson, estimates that the English wheat crop will be 23,164,243 bushels short for the home supply. The wheat crop of Great Britain is estimated at 7,954,755 bushels.

KEEPING LARD.

To keep lard sweet it should be put in good well-glazed jars. Barrels are almost certain to leak, and tin will soon turn the lard next to the can yellow and rancid. To a common-sized boiler, holding from 10 to 12 gallons of fat, half a pint of common dripped lye is to be added if the lard is to be kept any length of time. This will cause all the impurities to rise to the top, where they can be skimmed off easily, and the lard itself will be as white as snow.

TO CLEAR AWAY THE FLIES.

A CUPFUL of carbolic acid in a hot saucer or fryingpan in the middle of a closed room for an hour will clear it of flies.

LIQUID MANURE.

A SIMPLE and cleanly way of applying liquid manure to pot plants, is first of all to make a strong liquid manure, and into this put dry charcoal. When the charcoal is thoroughly soaked, take it out and dry it. When re-potting plants put a little of it into the bottom of the pot. When the roots of the plant reach it, the effect is soon visible. By this means there is no smell as in using the manure in a liquid state.

PICKLE FOR CURING MUTTON HAMS.

MR. J. T. BRIGGS sends the following recipe, which he has found to be quite reliable for saving mutton hams:—

| | | | | |
|--------------------------|-----|-----|-----|-----------|
| Black horse salt | ... | ... | ... | 3 ½ lb. |
| Saltpetre | ... | ... | ... | ¼ " |
| Coarse sugar or molasses | ... | ... | ... | 1 ½ " |
| Mixed spice | ... | ... | ... | 1 oz. |
| Juniper berries | ... | ... | ... | 1 " |
| Pearl ash | ... | ... | ... | ¼ " |
| Water | .. | ... | ... | 1 gallon. |

The hams should remain in pickle three weeks, being slightly agitated daily, after which they can be smoked.

RECORD SHIPMENT OF EGGS.

THE "Himalaya," which left Melbourne for London last month, took away a record shipment of eggs, consisting of 1,720 cases, representing 412,800 eggs, and aggregating 86 tons.

WOODEN MATCHES.

ABOUT 40,000,000 feet of timber are annually made into matches in America.

AGRICULTURAL AND HORTICULTURAL SHOWS.

THE Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

The Markets.

AVERAGE PRICES FOR OCTOBER.

| Article. | | | | | | | OCTOBER | | |
|---------------------------|-----|-----|-----|-----|-----|-------|-------------|----|------------------|
| | | | | | | | Top Prices. | | |
| | | | | | | | £ | s. | d. |
| Bacon | ... | ... | ... | ... | ... | lb. | 0 | 0 | 6 $\frac{1}{2}$ |
| Bran | ... | ... | ... | ... | ... | ton | 6 | 5 | 7 $\frac{1}{2}$ |
| Butter, First | ... | ... | ... | ... | ... | lb. | 0 | 0 | 10 $\frac{1}{2}$ |
| Butter, Second | ... | ... | ... | ... | ... | " | 0 | 0 | 7 |
| Chaff, Mixed | ... | ... | ... | ... | ... | ton | 3 | 7 | 6 |
| Chaff, Oaten | ... | ... | ... | ... | ... | " | 4 | 8 | 9 |
| Chaff, Lucerne | ... | ... | ... | ... | ... | " | 3 | 5 | 0 |
| Chaff, Wheaten | ... | ... | ... | ... | ... | " | 2 | 10 | 0 |
| Cheese | ... | ... | ... | ... | ... | lb. | 0 | 0 | 5 $\frac{1}{2}$ |
| Flour | ... | ... | ... | ... | ... | ton | 9 | 15 | 0 |
| Hay, Oaten | ... | ... | ... | ... | ... | " | 3 | 16 | 3 |
| Hay, Lucerne | ... | ... | ... | ... | ... | " | 2 | 4 | 4 $\frac{1}{2}$ |
| Honey | ... | ... | ... | ... | ... | lb. | 0 | 0 | 1 $\frac{1}{2}$ |
| Rice, Japan (Bond) | ... | ... | ... | ... | ... | ton | 14 | 5 | 0 |
| Maize | ... | ... | ... | ... | ... | bush. | 0 | 4 | 2 $\frac{1}{2}$ |
| Oats | ... | ... | ... | ... | ... | " | 0 | 3 | 1 $\frac{1}{2}$ |
| Pollard | ... | ... | ... | ... | ... | ton | 6 | 10 | 7 $\frac{1}{2}$ |
| Potatoes | ... | ... | ... | ... | ... | " | 4 | 13 | 9 |
| Potatoes, Sweet | ... | ... | ... | ... | ... | " | 1 | 15 | 9 |
| Pumpkins, Table | ... | ... | ... | ... | ... | " | 2 | 3 | 9 |
| Sugar, White | ... | ... | ... | ... | ... | " | 14 | 12 | 6 |
| Sugar, Yellow | ... | ... | ... | ... | ... | " | 12 | 7 | 6 |
| Sugar, Ration | ... | ... | ... | ... | ... | " | 10 | 7 | 6 |
| Wheat | ... | ... | ... | ... | ... | bush. | 0 | 3 | 6 $\frac{1}{2}$ |
| Onions | ... | ... | ... | ... | ... | cwt. | 0 | 8 | 1 $\frac{1}{2}$ |
| Hams | ... | ... | ... | ... | ... | lb. | 0 | 0 | 9 $\frac{1}{2}$ |
| Eggs | ... | ... | ... | ... | ... | doz. | 0 | 0 | 6 $\frac{1}{16}$ |
| Fowls | ... | ... | ... | ... | ... | pair | 0 | 4 | 3 |
| Geese | ... | ... | ... | ... | ... | " | 0 | 6 | 7 $\frac{1}{2}$ |
| Ducks, English | ... | ... | ... | ... | ... | " | 0 | 4 | 6 |
| Ducks, Muscovy | ... | ... | ... | ... | ... | " | 0 | 6 | 0 |
| Turkeys, Hens | ... | ... | ... | ... | ... | " | 0 | 7 | 6 |
| Turkeys, Gobblers | ... | ... | ... | ... | ... | " | 0 | 19 | 6 |

ENOGERA SALES.

| Article. | | | | | | | OCTOBER. | | |
|------------------------|-----|-----|-----|-----|-----|-----|-------------|----|------------------|
| | | | | | | | Top Prices. | | |
| | | | | | | | £ | s. | d. |
| Bullocks | ... | ... | ... | ... | ... | ... | 7 | 0 | 0 |
| Cows | ... | ... | ... | ... | ... | ... | 5 | 1 | 10 $\frac{1}{2}$ |
| Wethers, Merino | ... | ... | ... | ... | ... | ... | 0 | 15 | 2 $\frac{1}{2}$ |
| Ewes, Merino | ... | ... | ... | ... | ... | ... | 0 | 13 | 0 $\frac{1}{2}$ |
| Wethers, C.B. | ... | ... | ... | ... | ... | ... | 0 | 15 | 4 $\frac{1}{2}$ |
| Ewes, C.B. | ... | ... | ... | ... | ... | ... | 0 | 15 | 3 |
| Lambs | ... | ... | ... | ... | ... | ... | 0 | 13 | 8 |
| Baconers | ... | ... | ... | ... | ... | ... | 1 | 13 | 0 |
| Porkers | ... | ... | ... | ... | ... | ... | 1 | 2 | 2 |
| Slips | ... | ... | ... | ... | ... | ... | 0 | 7 | 6 |

Orchard Notes for December.

By ALBERT H. BENSON

IN the Orchard Notes for November, I called special attention to the importance of marketing fruit properly, emphasising the necessity for careful handling, even grading, and attractive packing if satisfactory prices are to be obtained. Those remarks apply equally to the present month, or, in fact, to any month of the year, as there is always more or less fruit of one variety or another to be marketed; and it is simply wasting time and money cultivating, pruning, manuring, or spraying an orchard—in fact, doing everything possible to produce good fruit—if when the fruit is grown it is not put on the market in such a manner that it will realise the highest price. Careful handling, grading, packing, and marketing will secure a ready sale for good fruit in any market, even when the same fruit badly handled and unattractively got up would be unsaleable. Growers would do well to take a lesson in packing from the Californians who have been shipping apples, or from the Italians who are shipping lemons, to this colony, as those fruits, even after a long and trying voyage and one or more transshipments, reach here in better condition and in a much more attractive state than our local fruit, which is often only carted a few miles.

Keep down pests wherever met with; gather and destroy all fly-infested fruit. Destroy orange bugs before they become mature by hand-picking or by driving them to the trunks of the trees, by tapping the outer branches with light poles, the insects being brushed off from the trunks and main branches on to a sheet placed under the tree to catch them, from which they can be easily gathered and burnt.

All caterpillars, cut-worms, beetles, grasshoppers, crickets, or other insects destroying the foliage should be destroyed by either spraying the same with Paris green, 1 oz. to 10 gallons of water, or by dusting them with a mixture of Paris green and air-slacked lime, 1 oz. of Paris green to 5 lb. of lime. Keep the orchard well cultivated, especially in the dry districts; and where there is water available for irrigation, in such districts all citrus trees should receive a watering during the month unless there is a good fall of rain, when it will be of course unnecessary.

Pineapples, bananas, and other tropical fruit can be planted during the month, showery weather and dull days being chosen. The rainy season is the best time to transplant most tropical plants. Where it is desirable to go in for green-crop manuring, or for raising a green crop for mulching, cow peas can be sown, as they will be found to make a very rapid growth now, which will be strong enough to keep most weeds in check.

See that all surface and cut-off drains are in good working order, and not choked up with grass, weeds, &c., as heavy rain may fall during the month, and there should be a get-away for all surplus water, which would tend to either wash the soil or sour it; stagnant water round the roots of the trees being exceedingly injurious at any time, and especially so during the heat of summer.

Farm and Garden Notes for December.

Farm Notes.—Notwithstanding the fears expressed that the frosts of the first week of October would be productive of an almost total loss of wheat for grain, it is gratifying to think that there will be a fairly good harvest after all, especially of barley. Harvesting is now general, and will probably be concluded

by the new year. We would again impress upon farmers, particularly on new beginners, and on those who are entering on wheat cultivation for the first time, to take heed to the lessons given, not only in this *Journal*, but in most good agricultural papers, on the proper methods for saving the crop. We do not here enter into the question of the relative superiority of stripper *v.* reaper and binder. The question now is not one of the value of certain classes of machinery, but it is the important one of dealing with the crop when these have done their work. Barley should be allowed to become perfectly ripe before cutting (*see* article on barley in the *Journal*, Vol. II., p. 480, June, 1898), yet not over-ripe, or grain will be lost. It should be at once stooked—and carefully stacked—especially as there is a probability of showery weather shortly. Maize may still be sown in large areas. Sow sorghum, imphee, Kafir corn, and panicum. Arrowroot, ginger, and sweet potatoes may be planted. Attend to tobacco. Keep all crops clean, and thin out if too close planted.

Kitchen Garden.—French beans may still be sown in moist weather, or, where plenty of water is available, the drills may be well soaked before sowing the seed. Cucumbers, melons, marrows, &c., should be well watered when necessary with liquid manure. Cucumbers should always be well watched to see that none become ripe, unless wanted for seed. As soon as they begin to ripen, the vitality and bearing capacity of the plants are very much weakened. Seeds of all these vegetables may still be sown for succession. Tomatoes should now be in full bearing. The plants ought to be supported in some way, either by strings on stakes or by propping up with small branches like pea-sticks. By this means the fruit is easy to gather, and is kept clean. Onions should now be ready to take up and store. They ought to be spread out thinly in a dry open shed until the tops wither sufficiently to pull off easily; then graded into sizes, and sent to market or stored in a cool dry place. Maize: The sugar or sweet varieties of maize ought to be grown as summer vegetables. These are well adapted for table use, and ought to be more extensively used than is the case. It is unnecessary to say anything about their cultivation. Salads: It is almost too hot in most districts to grow lettuce or other salad plants now, unless an unlimited water supply or some little shade can be obtained.

It may be worth while to mention, for the benefit of those who grow no vegetables, that the weed commonly known as “fat hen” makes an excellent table vegetable if cooked in the same way as spinach, which it then very much resembles in taste and appearance.

Flower Garden.—The chief work in the flower garden now consists of watering, stirring the soil, and removing decayed and spent flowers. Roses especially should have all spent flowers regularly cut off, as their blooming season will be thereby considerably lengthened. If aphid or Rose Scale make their appearance, spray with kerosene emulsion, taking care that the spraying is not done on very hot dry days, but in the early mornings or evenings. Chrysanthemums now require a good deal of attention, such as staking, pinching, &c.; and frequent waterings with weak liquid manure should be applied. It will be found of great benefit to the plants to syringe them overhead every afternoon just before sundown. No suckers should be allowed to grow until the plants have ceased flowering; and caterpillars, aphid, &c., must be watched for and destroyed. Dahlias will require plenty of water, and an occasional dose of liquid manure. They should also be kept staked up and well supported to prevent their stems from being broken in windy weather. Bulbs which have finished flowering should have the dead leaves removed, and when quite dried up should be taken up and stored. Keep weeds well under command, as the plants usually require all the moisture in the soil at this season, and cannot afford to be robbed of any portion of their nourishment by weeds.

Horticultural Notes.

By PHILIP MAC MAHON,
Curator, Botanic Gardens.

THE hottest day on record in Brisbane occurred during the month of December. It was on the 26th December, 1893, when the mercury stood at 105.9 degrees in the shade. The mean shade temperature of the month is 73 degrees. On the average more rain falls than during the preceding eight months, but less than in January, February, or March.

Sunlight is a great chemical agency, and the more land is exposed to it the better for the land. It will be well, therefore, to have all land not in actual use thrown up roughly, so as to get the benefit of the air and sunlight. These agencies assist in breaking down the insoluble materials of which the soil is composed, and rendering them fit to become the food of the plants which you will presently entrust to it. Every foot of land which is out of crop should be ridged up in the hot weather. Land which is allowed to lie with a caked surface is worse than idle. It is deteriorating.

You may soon expect heavy tropical rains, and it behoves you to see that your drains are in good order before they begin, because you cannot make a good job of them when it begins to rain, and the necessity is brought home to you in a very unpleasant way. You will have noticed that land which is exposed, from its conformation, to the constant washing of water from higher levels is always barren, but land upon which the water is allowed to deposit the materials which it brings from these higher levels, and then permitted to pass gradually away, is always rich.

Too much scour is as much to be deprecated as want of drainage; and what is often described as "magnificent drainage" simply means that every facility is afforded for the water to carry the plant food from the soil and deposit it somewhere else, generally where it is no good to anyone. Rain water itself contains a good deal of plant food; and if you can bring it into intimate contact with the soil before it escapes from your garden or farm, you are simply catching so much manure, for which you would have to pay money if you procured it in any other shape, and storing it up in the soil to be converted later on into crops which you can sell. I have asked hundreds of the most intelligent of the State school pupils why land is drained, and they have all answered that it was to get the water away from the soil as quickly as possible. The object of intelligent draining is to pass the water slowly through the land, forcing it to leave its enriching qualities behind, and just so much of itself as the land is able to absorb and retain without crowding out the necessary quantity of air. The engineer's drainage is, therefore, different from the farmer's. The former wants to get rid of the water before it has had time to enter the surface of his roads or other works; the latter wants it to soak in, and then to get rid of that portion which cannot be beneficially retained.

Keep the surface of your land well stirred. Do not always stir to the same depth. If you do, you are likely to form a "pan" or caked surface beneath the layer of loose soil. It is a good plan to alternate a light hoeing with a deep hoeing, and it is also well to use a pronged tool for breaking up the surface. I have had some capital tools for this purpose made by saving worn-out digging forks and getting the blacksmith to turn down the tines at right angles. They are then fitted with convenient handles, and a thoroughly good and cheap tool is available. Where the "Avery" cultivator is used it is well to put on the tined tool occasionally instead of the hoeing tool, so as to break up any "pan" which may have been formed.

This is the month to fight insects. Everything is fighting on your side this month, but if you let the enemy get the benefit of the tropical growth and of their own increase in numbers you will, at the best, be only able to hold your own, while if you attack them now you will be able to inflict grave losses on your foes. If you fancy that you will discover some means of getting rid of the necessity of constant and watchful attention to this subject, you are doomed to disappointment. So long as you cultivate you will have to fight "the worm in the bud" and his allies.

At this time you will note that mildew is very much in evidence. Bordeaux mixture with molasses is a good remedy. It is made by taking 5 lb. of fresh lime, 5 lb. of molasses, 5 lb. of bluestone, and 25 gallons of water. The lime should be slaked in water and mixed up into a cream, and then strained through a coarse cloth into a wooden vessel. Then dissolve the molasses in water, and add to the strained lime mixture. Dissolve the bluestone in four times its bulk of water, stir up all together, and then add sufficient water to bring the whole up to 25 gallons. You must use this with judgment. Every plant will not stand the same strength of the mixture. In summer you may add sufficient water to bring the whole bulk up to 50 gallons, and when the foliage is delicate you may dilute it until the above ingredients make 75 gallons of the mixture. In small gardens, dusting with sulphur is good in cases of mildew. Fill an old stocking with flowers of sulphur: tie this to a stick of a convenient length, and then go amongst your plants, dusting the affected ones over with the sulphur, which will pass readily through the stocking or a coarse cloth. Rosegrowers will find this fungus a great plague just now. I know one very successful grower who says that he is so disgusted with it that he seriously contemplates pulling out the greater part of his plants.

You can easily recognise mildew, although, strange to say, I have met many persons who grow plants, but who did not know it. You will notice on the leaves of your roses—especially those leaves growing near the end of the shoot—patches of a white powdery substance. This sometimes spreads over the whole back of the leaf, which curls up. With a good glass, by looking at the fungus from the side, you can make out that it is growing on the leaf, whose spores it rapidly chokes. Frequently it attacks only one side of the leaf at first, and then that side shrinks inward and curls up, conveying in a curious manner the idea that it is in pain. Aphis is very likely to prove troublesome in this kind of weather. These gentry usually choose the growing point of the shoot, which they soon injure very seriously. Kerosene emulsion seems to be the best remedy for these. Two gallons of kerosene and $\frac{1}{4}$ lb. of soap will make 30 gallons of the mixture, which should be applied in a fine spray.

Weeds must be vigorously fought. If you have a patch of weeds which you cannot reach upon to root out, run the scythe or mower over them if they are about to seed. Do not let them bring up reinforcements in the shape of seedlings. Do not let nut-grass flower. Keep it cut off as it attempts to do so.

Look after hedges, and keep them cut as they grow. If you allow them to throw out robust shoots without cutting, you will find that they will become bare. The value of hedge plants as shelters does not seem to be taken advantage of in this country as much as it deserves. Camphor laurels planted 8 feet apart make a splendid shelter hedge. They have the recommendation that their roots always go downwards, and do not rob the immediate surface soil. That is why you so often see such miserable specimens of camphor laurels on land having a clay subsoil. Camphor laurels can be cut with the knife into a compact and very beautiful hedge, and they harbour no insect foes.

In the flower garden a few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, cockscomb, and celosia. A small sowing of each of the above may be made. If you have amaranthus pricked off ready for planting, you can plant them out now. They should be planted in masses against a dark background of foliage, where their gorgeous colours can show up to advantage. If you have not seedlings, you can still sow in boxes, and prick off when the little plants can be handled.

Annuals which have done flowering should be cleared away at once. It is the rule here to burn these, as they are thus prevented from adding to the unwelcome ranks of insect pests.

Alternanthera, in its varieties, makes a very useful edging plant in this climate. There are eleven varieties, viz.:—*A. amabilis*, *A. amabilis amena*, *A. amabilis tricolor*, *A. Bettzichiana*, *A. Bettzichiana spathulata*, *A. ficoidea*, *A. paronychoides*, *A. paronychoides magnifica*, *A. paronychoides major*, *A. paronychoides major aurea*, *A. versicolor*. These can be readily propagated now from cuttings. Bulbs should have all the old leaves cut away as they become withered, but the green leaves should not be touched. Chrysanthemums require to be staked, and as the flower buds develop they should be supplied with weak liquid manure, and it will benefit them very much to be syringed of afternoons. These may still be planted for successional flowering; and, if a few old plants are cut back, cuttings may be obtained in January, which will give late blooms of these favourites. Chrysanthemums must have good soil, and that well manured. It is mere waste of time to plant them in poor soil. Coleus may be planted now, and propagated from cuttings. They should, where the time can be spared, be kept in shape by nipping. In an establishment like this, many things have to be left undone which one recommends to people who can do them, for the simple reason that we have hardly the time to do really urgent and necessary work. Crotons can now be planted and also reproduced by cuttings. We strike them quite freely without any artificial aid, save that of a low bush-house. Dahlias will be in various stages. This year they were rather late in breaking, and in some places they may even be planted yet, but the greater part will have been planted and in need of staking. Look after this as they grow, and don't have a big day of staking after they have got out of hand. Let them have liquid manure, and never let them get dried up. A dahlia soon shows you that it is thirsty, and does not recover the experience readily. Dracenas may be planted. You know that these very graceful plants may be increased by taking off a piece of the underground stem or rhizome, with a few roots attached, and placing it in the earth, growing point upwards. It soon starts on its own account. Fuchsias which have been planted in a shady place will require to be kept in shape by nipping. Hippeastrums are a class of bulbs which make a splendid show in Queensland gardens. There are many fine varieties. They do not want to be dried off in the way in which many bulbs are. This injures them, as they are really partially evergreen. They are going off just now, and when the leaves die down the plants should be allowed to rest for a time. Before the heavy rains set in they should be lifted and stored in boxes of sand, but never kept completely dry. When they show signs of growth they should be replanted in soil containing a goodly proportion of vegetable manure and sand, in a well-drained position. The smaller bulbs should be separated and planted by themselves. You will be rewarded for your trouble by a most brilliant display of flower on the more matured bulbs. Plant in a mass, rather than spread them about amongst borders, as by this much of the effect is lost. Narcissus require to be lifted about the end of the year. Do not store, but plant out at once in their new positions. Palms may be planted, and I would advise every land-owner in the colony to plant these beautiful plants in considerable quantity. They do not require a great deal of after attention, and their appearance adds distinctly to the value of a property. They are surface feeders, and do not require a great depth of soil. Many of them will thrive where many apparently more hardy trees will perish. As you cut roses you should cut them with long stalks, unless by so doing you cut off too many buds. In any case you should go over them and cut back the shoots upon which the flowers were borne. This will give you a second lot of bloom. All tropical shrubs may be planted this month, and this is also true of all tropical fruits, such as bananas, pineapples, &c.

Lawns should be top-dressed, where this is required, this month. Attention should be paid to mowing. Where a lawn-mowing machine is used it is better to allow the cut grass to remain on the surface, where it acts as a mulch, and

protects the roots of the growing grass. Where it is desired to sow lawns, this is a good time to do it, looking out for showery weather. It is often desired to cut a lawn edge perfectly straight for a considerable distance, and the ordinary garden line is not found suitable for the purpose, because it can only be stretched true for a certain short distance. I use a long piece of wire (Birmingham wire gauge No. 13). It is strained by means of the "Bufallo" wire grip used by the Post and Telegraph Department for straining the telegraph wires. This works with two small blocks and a line. A substitute can be made by any handy man. A quarter of a mile is the length we generally set it to, but it can be drawn as tense and straight as a harp string for half a mile. A few small pegs at equal distances will then keep it in position. We find it handier to use than an ordinary garden line and as quickly set.

The shade garden or bush-house will need attention in the matter of shade. Do not let this be too dense. This is the chief cause of failure in these structures. Plant up all bare places, and top-dress with good loam mixed with leaf-mould and sand. Keep the atmosphere in this structure as damp as possible, not only by watering the plants but by scattering water about the floors and empty spaces. Achimenes are probably now flowering, and will require less and less water as they begin to dry off. Caladiums will be better for occasional waterings with liquid manure. A good way of doing with these is to pot them in the first instance low in the pots, and then topdress them with a rich soil as they make growth. When you repot these plants do not disturb the ball of earth too much. Like palms, they detest having their roots interfered with. Cinerarias may be sown at the end of the month. *Eucharis amazonica*, which makes such a charming button-hole, is much more easily grown than is generally thought. This month it should be treated to weak liquid manure about twice a week. Ferns should have old fronds removed. Very many people are under the impression that to give liquid manure to ferns is to kill them, but, as a matter of fact, a little weak liquid manure now and again in the growing season improves them, especially the more robust kinds. Gloxinias should be kept damp when they are in flower. In this climate they are very subject to Red Spider. They also should have weak liquid manure when in flower. Primulas may be sown at the end of the month. See directions for sowing small seeds already published in this *Journal*. *Streptocarpus*, of which there are many new and beautiful varieties, will now be flowering. Many of the best varieties have not yet found their way into this country. It will be well to bear in mind that stocks for budding should now be got ready, and that the first three months of the new century will be a busy time in the garden. Lay all your plans, make lists of the seeds you want, order them early, because your nurseryman himself wants to take time by the forelock, and make up his lists in good time.

